NAVAL POSTGRADUATE SCHOOL

MONTEREY, CALIFORNIA

THESIS

AN ANALYSIS OF PROMOTION AND RETENTION FACTORS AMONG HISPANIC AND NON-HISPANIC MARINE CORPS OFFICERS

by

Mateo E. Salas

March 2015

Thesis Advisor: Simona Tick
Co-Advisor: Stephen Mehay

Approved for public release; distribution is unlimited

THIS PAGE INTENTIONALLY LEFT BLANK

REPORT DOCUMENTATION PAGE	*Form Approved OMB No. 0704–0188*

Public reporting burden for this collection of information is estimated to average 1 hour per response, including the time for reviewing instruction, searching existing data sources, gathering and maintaining the data needed, and completing and reviewing the collection of information. Send comments regarding this burden estimate or any other aspect of this collection of information, including suggestions for reducing this burden, to Washington headquarters Services, Directorate for Information Operations and Reports, 1215 Jefferson Davis Highway, Suite 1204, Arlington, VA 22202-4302, and to the Office of Management and Budget, Paperwork Reduction Project (0704-0188) Washington, DC 20503.

1. AGENCY USE ONLY *(Leave blank)*	2. REPORT DATE March 2015	3. REPORT TYPE AND DATES COVERED Master's Thesis	
4. TITLE AND SUBTITLE AN ANALYSIS OF PROMOTION AND RETENTION FACTORS AMONG HISPANIC AND NON-HISPANIC MARINE CORPS OFFICERS		**5. FUNDING NUMBERS**	
6. AUTHOR(S) Mateo Salas			
7. PERFORMING ORGANIZATION NAME(S) AND ADDRESS(ES) Naval Postgraduate School Monterey, CA 93943-5000		**8. PERFORMING ORGANIZATION REPORT NUMBER**	
9. SPONSORING /MONITORING AGENCY NAME(S) AND ADDRESS(ES) N/A		**10. SPONSORING/MONITORING AGENCY REPORT NUMBER**	

11. SUPPLEMENTARY NOTES The views expressed in this thesis are those of the author and do not reflect the official policy or position of the Department of Defense or the U.S. Government. IRB Protocol number____N/A____.

12a. DISTRIBUTION / AVAILABILITY STATEMENT Approved for public release; distribution is unlimited	12b. DISTRIBUTION CODE	

13. ABSTRACT (maximum 200 words)

Hispanics are the fastest-growing demographic group in the U.S. This thesis reviews Marine Corps policies on the recruitment, retention, and promotion of talented officers of a diverse background, and applies quantitative multivariate analysis methods to identify pre-commissioning and post-commissioning factors, such as college performance, accession source, military training and fitness report scores that explain any differences in job performance measures of Marine Corps officers of different ethnic backgrounds. Using data on 7,780 Marine Corps officers commissioned from 1999 to 2004, the findings from multivariate regression analysis show that Hispanic Marine Corps officers have a greater likelihood of retention but no difference in fitness report performance and no difference in the probability of promotion to O4 in comparison to non-Hispanic officers.

14. SUBJECT TERMS USMC, Hispanics, promotion, retention			15. NUMBER OF PAGES 121
			16. PRICE CODE
17. SECURITY CLASSIFICATION OF REPORT Unclassified	18. SECURITY CLASSIFICATION OF THIS PAGE Unclassified	19. SECURITY CLASSIFICATION OF ABSTRACT Unclassified	20. LIMITATION OF ABSTRACT UU

THIS PAGE INTENTIONALLY LEFT BLANK

AN ANALYSIS OF PROMOTION AND RETENTION FACTORS AMONG HISPANIC AND NON-HISPANIC MARINE CORPS OFFICERS

Mateo E. Salas
Major, United States Marine Corps
B.S., California State Polytechnic University, Pomona, 2000

Submitted in partial fulfillment of the
requirements for the degree of

MASTER OF SCIENCE IN MANAGEMENT

from the

**NAVAL POSTGRADUATE SCHOOL
March 2015**

Author: Mateo E. Salas

Approved by: Dr. Simona Tick
                 Thesis Advisor

                 Dr. Stephen Mehay
                 Co-Advisor

                 Dr.William Gates
                 Dean, Graduate School of Business and Public Policy

iii

THIS PAGE INTENTIONALLY LEFT BLANK

ABSTRACT

Hispanics are the fastest-growing demographic group in the U.S. This thesis reviews Marine Corps policies on the recruitment, retention, and promotion of talented officers of a diverse background, and applies quantitative multivariate analysis methods to identify pre-commissioning and post-commissioning factors, such as college performance, accession source, military training and fitness report scores that explain any differences in job performance measures of Marine Corps officers of different ethnic backgrounds. Using data on 7,780 Marine Corps officers commissioned from 1999 to 2004, the findings from multivariate regression analysis show that Hispanic Marine Corps officers have a greater likelihood of retention but no difference in fitness report performance and no difference in the probability of promotion to O4 in comparison to non-Hispanic officers.

THIS PAGE INTENTIONALLY LEFT BLANK

TABLE OF CONTENTS

LIST OF FIGURES

THIS PAGE INTENTIONALLY LEFT BLANK

LIST OF TABLES

LIST OF ACRONYMS AND ABBREVIATIONS

BOC	Basic Officer Course
CD	Career Designated
CDF	Cumulative Distribution Function
CMC	Commandant of the Marine Corps
CNA	Center for Naval Analysis
CSS	Combat Service Support
DOD	Department of Defense
ECP	Enlisted Commissioning Program
FY	Fiscal Year
GCT	Grade Technical Score
GPA	Grade Point Average
GWOT	Global War on Terror
MAGTF	Marine Air Ground Task Force
MCCOAC	Marine Corps Officer Accession Career
MCMAP	Marine Corps Martial Arts Program
MCO	Marine Corps Order
MCP	Meritorious Commissioning Program
MCRISS	MCRC Information Support System
MCRC	Marine Corps Recruiting Command
MECEP	Marine Enlisted to Commissioning Education Program
MLDC	Military Leadership Diversity Council
MLE	Maximum Likelihood Estimation
MMOA	Manpower Management Officer Assignments
MMRP	Manpower Management Records and Performance
MOS	Military Occupational Specialty
MRO	Marine Reported On
MSR	Minimum Service Requirement
NROTC	Naval Reserve Officer Training Corps
OCC	Officer Candidate Course
OCS	Officer Candidate School

OLS	Ordinary Least Square
OPMEO	Office of Diversity Management & Equal Opportunity
PES	Performance Evaluation System
PI	Performance Index
PLC	Platoon Leaders Class
PME	Professional Military Education
POI	Program of Instruction
PRF	Population Regression Function
RO	Reviewing Officer
RS	Reporting Senior
SAT	Scholastic Aptitude Testing
SPC	Staff Platoon Commander
STEM	Science Technology Engineering Mathematics
TBS	The Basic School
TFDW	Total Force Data Warehouse
USMC	United States Marine Corps
USNA	United States Naval Academy
YCS	Years Commissioned Service

ACKNOWLEDGMENTS

I would like to thank my family and friends for the support and encouragement I received throughout this entire process. Your support motivated me to work harder and make this work meaningful. I would also like to especially thank my faculty advisors for the personal and professional support that was essential for all aspects of this thesis. Most importantly, thank you to my wife and kids for allowing me the time away to complete my educational endeavor. Your unselfish support and understanding empowered me through the tough times, and I would not have been able to do it without you.

THIS PAGE INTENTIONALLY LEFT BLANK

I. INTRODUCTION

A. BACKGROUND

The National Defense Authorization Act of 2009 established a requirement for a commission to conduct a comprehensive evaluation and assessment of policies and practices that shape diversity among military leaders (NDAA, 2008). The Military Leadership Diversity Commission (MLDC) was formed to accomplish this task and released their report in 2011. Some of their findings noted that "the top military leaders are representative neither of the population they serve nor of the forces they lead" (MLDC Final Report, 2011, p. XVI). The MLDC had several recommendations for improving diversity of senior leadership to include eliminating barriers that disproportionately affect the advancement of racial or ethnic minorities.

B. PROBLEM

The MLDC's diversity and equal opportunity concerns and recommendations are particularly relevant to the Hispanic service members. According to U.S. census estimates, Hispanics or Latinos compose 16.9 percent of the total U.S. population and this percentage is projected to increase further (Humes, Jones, & Ramirez, 2011). Between 2000 and 2010, more than half of the population growth in the United States was due to the growth of Hispanics. As the number of Hispanics in the U.S. population has increased, so has their representation in the military services. In particular, in 2003, Hispanic representation in the Marine Corps exceeded the national representation with over 15 percent of the entire Marine Corps being of Hispanic descent (Quester, Hattiangadi, Lee, Hiatt, & Shuford, 2007).

These trends have created great interest in the role of Hispanics in meeting the Marine Corps' future manpower needs. Despite representing 16.9 percent of the total U.S. population, Hispanics are underrepresented within the military's leadership; only 5.5 percent of officers are of Hispanic descent (MLDC Final Report, 2011, p. 41). The MLDC Final Report also found that Hispanic officers' promotion rates were below the service and pay grade-specific averages in all services except the Army (MLDC Final

Report, 2011, p. 76). The MLDC Final Report also noted that, in the Marine Corps, Hispanic promotion rates to O-8 were very low (2011). The representation and performance of Hispanics in the officer corps presents an ongoing challenge to Marine Corps policymakers in maintaining diversity in the officer corps.

C. PURPOSE

This study will conduct an analysis of the retention and performance of Hispanic officers in the U.S. Marine Corps compared to that of non-Hispanic officers. The intent is to identify the demographic characteristics, commissioning source, education, and career performance factors that may explain any differences in career milestones and achievement between Hispanic and non-Hispanic Marine Corps officers. The end result will hopefully provide the Marine Corps with policy development and support in creating the measures that improve retention and promotion of Hispanic officers in the Marine Corps as intended by the MLDC.

D. RESEARCH QUESTIONS

1. Primary Research Question

- Are there any differences in retention and promotion rates between Hispanic and non-Hispanic Marine Corps officers?

2. Secondary Research Questions

- Prior to commissioning, are there any differences in education and academic test scores between Hispanic and non-Hispanic Marine Corps officers? If so, how do these differences affect promotion and retention rates between Hispanic and non-Hispanic Marine Corps officers?
- Does performance at The Basic School (TBS) differ between Hispanic and non-Hispanic Marine Corps officers? If so, how do these differences affect promotion and retention rates between Hispanic and non-Hispanic Marine Corps officers?
- Does the assignment of Marine Corps officers into different military occupational specialties (MOS) differ between Hispanic and non-Hispanic officers? If so, how do these differences affect promotion and retention rates between Hispanic and non-Hispanic Marine Corps officers?
- Does the career experience following TBS differ between Hispanic and non-Hispanic Marine Corps officers? If so, how do these differences affect

promotion and retention rates between Hispanic and non-Hispanic Marine Corps officers?

- Does fitness report performance differ between Hispanic and non-Hispanic Marine Corps officers? If so, how do these differences affect promotion and retention rates between Hispanic and non-Hispanic Marine Corps officers?
- Which variables effect fitness report performance and how do these variables differ between Hispanic and non-Hispanic officers?

E.   SCOPE AND LIMITATIONS

This thesis uses panel data provided by the Marine Corps and Center for Naval Analysis (CNA) for Marine Corps officers who served between fiscal year (FY) 1999 through 2014. The Marine Corps databases merge Total Force Data Warehouse (TFDW) demographic data with fitness report data from Manpower Management's Records and Performance Evaluation Section (MMRP-30). Also, data from the Center for Naval Analysis provides information from the Marine Corps Recruiting Command's (MCRC) Information Support System (MCRISS) and student records from TBS. Longitudinal files are created to track officer career progress and performance for cohorts who entered service between fiscal years 1999 and 2004. They are followed annually until their 10-year service mark or until separation. Research will use multivariate estimating models to analyze the effects of demographics and pre-accession factors on officer early career performance measures including, attrition, retention, and promotion to O4.

F.   ORGANIZATION OF THE STUDY

This research is organized into six chapters. The first chapter is the introduction and provides initial background information and the purpose of this study. It also specifies the primary and secondary research questions. Chapter II provides detailed background information on the Hispanic population in the United States and covers Marine Corps officer accession programs, the Basic Officer Course (BOC) at TBS, and the Marine Corps Performance Evaluation System's (PES) fitness reporting. Chapter III reviews current or recent literature that relates to the theoretical methods used in this analysis. Chapter IV describes the variables of the study and analyzes the data. Chapter IV also explains the coding, cleaning, and aggregation of the final data set. Chapter V

describes the regression models and lists the results of the multivariate data analysis. Chapter VI summarizes the research with conclusions and provides recommendations.

II. BACKGROUND

A. INTRODUCTION

This study seeks to focus on the Hispanic population in the United States and the U.S. Marine Corps and to identify potential factors that may explain various manpower policy issues. The intent of this chapter is to provide the readers with a basic background on the Hispanic population in the United States and representation and accessions of Hispanics in the U.S. Marine Corps.

B. HISPANICS

Part of the primary question this thesis attempts to answer is whether retention and promotion outcomes differ between Hispanics and non-Hispanics. The focus on this particular population group can be linked to diversity and equal opportunity objectives in the Department of Defense (DOD). The aim for improved diversity and equal opportunity is to improve the quality and effectiveness of the DOD as best described by the Office of Diversity Management and Equal Opportunity (ODMEO) website (http://diversity. defense.gov/About.aspx) that states:

> ODMEO envisions a Department of Defense that reflects the face of the Nation. To that end, we seek a Department that competes for the best and brightest talent our Nation has to offer. We focus our efforts on emerging talent to ensure that we successfully attract, recruit, develop and retain a highly-skilled Total Force capable of meeting current and future mission requirements.

Diversity and equal opportunity aims within the DOD may be of renewed interest due to the Hispanic population growth rate in the United States. According to U.S. census estimates, Hispanics or Latinos compose 16.9 percent of the total U.S. population which accounted for half the U.S. population growth between 2000 and 2010 (Humes et al., 2011). As seen in Table 1 with data from the U.S. Census Bureau website (http://www.census.gov/population/hispanic/data/2012.html), in 2012 there are over nine million Hispanic youths age 15 to 24, whereas there were around six million a decade earlier.

5

Table 1.   2012 U.S. Youth Population in thousands
(after U.S. Census, 2012)

Sex and age	Total		Hispanic	
	Number	Percent	Number	Percent
Both sexes	308,827	100.0	52,358	100.0
10 to 14 years	20,605	6.7	4,654	8.9
15 to 19 years	21,239	6.9	4,584	8.8
20 to 24 years	21,878	7.1	4,471	8.5
25 to 29 years	20,893	6.8	4,361	8.3
30 to 34 years	20,326	6.6	4,178	8.0
35 to 44 years	39,927	12.9	7,531	14.4

As the number of Hispanics in the U.S. population has increased, so has their representation in the military services. As noted previously, 2003 saw the Hispanic representation in the Marine Corps supersede the national representation (Quester et al., 2007). This growing trend in the Hispanic population and corresponding interest to DOD manpower planners requires an increased understanding on who makes up the Hispanic population in the United States.

In order to understand more about the Hispanic population, one needs to know how the Hispanic population is defined and distinguished from non-Hispanics. The U.S. Census Bureau's website (http://www.census.gov/topics/population/hispanic-origin/about.html) provides the following definition:

> People who identify with the terms "Hispanic" or "Latino" are those who classify themselves in one of the specific Hispanic or Latino categories listed on the decennial census questionnaire and various Census Bureau survey questionnaires "Mexican, Mexican American, Chicano" or "Puerto Rican" or "Cuban" as well as those who indicate that they are "another Hispanic, Latino, or Spanish origin." Origin can be viewed as the heritage, nationality group, lineage, or country of birth of the person or the person's ancestors before their arrival in the United States. People who identify their origin as Hispanic, Latino, or Spanish may be of any race.

While we now have a thorough definition of who makes up the Hispanic population, there are still problems with distinguishing Hispanics from non-Hispanics. With such a large and diverse group that is defined as Hispanic, it is still difficult to draw

conclusions about Hispanics as a whole. Arias and Dal (2006) acknowledged that Hispanics had no standardized opinion, but recognized that "the Hispanic population of the United States holds an array of attitudes, values and beliefs that are distinct from those of non-Hispanic whites and African Americans" (p. 26).

To assist with distinguishing Hispanics from non-Hispanics in the United States, the remaining portion of this section will report recent demographic statistics. Since military recruiters focus their efforts geographically, and based on academic performance of eligible military candidates, the area of focus will be on where Hispanics predominately reside in the United States and how they perform academically compared to non-Hispanics. Educational attainment is an important factor to consider since the DOD limits the number of recruits who are high school dropouts. The restriction on high school dropouts in the Marine Corps is more stringent than in the other services. The services restrict the portion of dropouts accessed because research shows that attrition rates of non-high school graduates are higher than those for high school graduates (Buddin, 1984).

According to a U.S. Census Bureau report (2010), the population dispersion of Hispanics throughout the United States varies from state to state. The report found that this occurred most often in the counties along the southern border states. As seen in Figure 1 from the 2010 Census Bureau report on the Hispanic population shows the counties that have elevated populations of Hispanics.
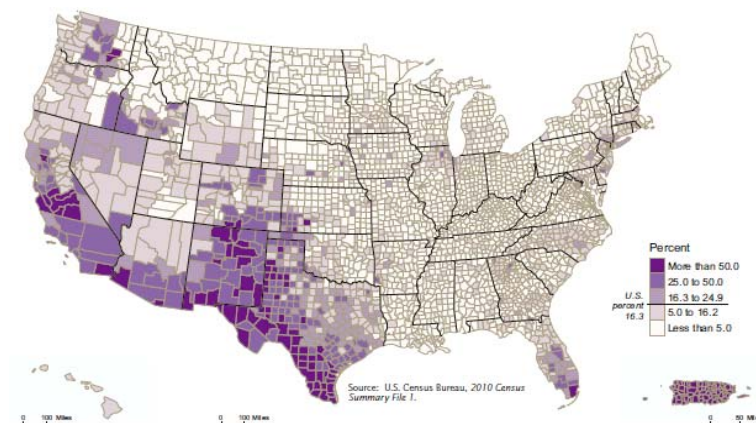
Figure 1.   Hispanic Population as a Percentage of the Total Population by
County (from Humes et al., 2011)

Humes et al. (2011) reported that between 2000 and 2010, population growth rates varied by individual Hispanic group. The report found that Hispanics who identify as being of Mexican origin saw increases by over 50 percent. Humes el al. calculated that this growth of 11.2 million people constituted the largest numeric change in the U.S. population growth. The report also noted that while the overall Hispanic population increased, the individual groups varied by state. As seen in Figure 2 taken from Humes et al. (2011), the majority of Hispanics are of Mexican origin and they make up the majority of Hispanics in 40 states. In general, the lesser numbered Hispanic groups tended to reside in states closest to their national origin. For example, Florida's proximity to Cuba coincides with the majority of Hispanics in Florida being predominantly of Cuban origin.
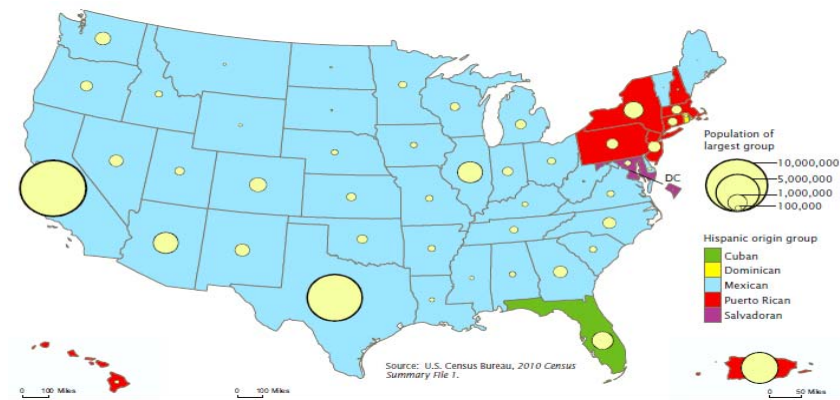
Figure 2.   Largest Detailed Hispanic Origin Group by State: 2010
(from Humes et al., 2011)

According to U.S. census data taken from their website (http://www.census. gov/compendia/statab/cats/education.html), educational attainment of Hispanics varies in comparison to non-Hispanics. The data shows that high school dropout rates by year, race and ethnicity and reports that in 2009, 82.1 percent of Hispanic 18- to 21-year-olds were enrolled in high school or were graduates. This is compared to 86.9 percent of blacks and 91.3 percent of whites in that age group taken from the same U.S. Census data. Additionally, as shown in Table 2, the same U.S. Census data shows that Hispanics drop

out of high school at higher rates than non-Hispanics and a larger share of the Hispanic youth population is composed of dropouts.

Table 2.   High School Dropout Rates by Race/Ethnic Group (after U.S. Census, 2011)

Race/ethnic group	Annual dropout rate	Share of youth population that are dropouts
Whites	3.00%	9.10%
Blacks	4.50%	11.60%
Hispanics	5.30%	20.80%

For the U.S. Marine Corps' officer corps, college degree requirements add additional factors to measure for educational attainment. According to a Pew Research Center report, Hispanic high school graduates in the class of 2012 for the first time saw their college enrollment rate exceeding that of non-Hispanics (Fry, 2012). According to this report, 69 percent of Hispanic high school graduates enrolled in college 2012 compared to either whites (67 percent) or blacks (63 percent). Figure 3, taken from the Pew report, shows the number of Hispanics enrolling in college immediately after high school has steadily increased.
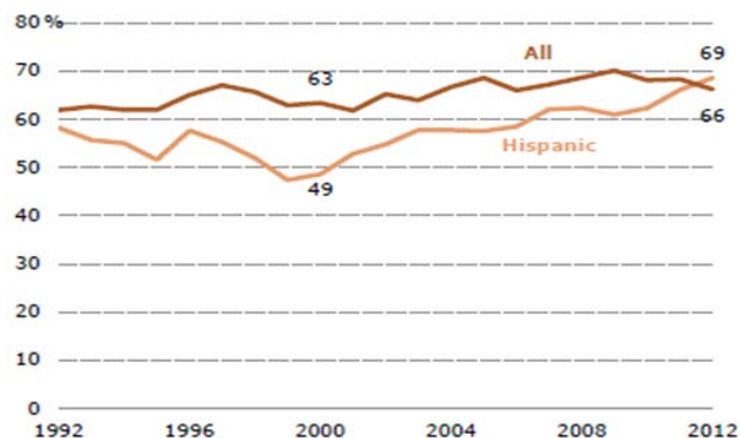
Figure 3.   High School Completers Entry into College (after Fry, 2012)

9

However, Fry (2012) also found that Hispanic college students enrolled in four-year colleges at a rate of 56 percent compared to 72 percent of whites. Additionally, this report found that Hispanics are less likely to attend a selective college, less likely to be enrolled in college full time, and less likely to complete a bachelor's degree.

One possible correlation between Hispanic college entrance and academic performance statistics can be seen based on Scholastic Aptitude Testing (SAT) results. According to the 2013 "*SAT Report on College and Career Readiness*" retrieved from (https://www.collegeboard.org/press), Hispanics have consistently under-performed on the SAT and have with lower test scores in comparison with the mean score of all students. As seen in Table 3, collegeboard.org report on SAT scores for college bound High School seniors show Hispanics who are Mexican-American, Puerto Rican, or Other Hispanic have average scores in the Critical Reading, Mathematics and Writing categories as much as 50 points lower than the average score of all students.

Table 3.   SAT Mean Scores of College-Bound Seniors by Race/Ethnicity
(retrieved September 28, 2012, from
http://media.collegeboard.com/digitalServices/pdf/research/TotalG
roup-2012.pdf)

Race/ethnicity	2005-06	2006-07	2007-08	2008-09	2009-10	2010-11	2011-12
SAT—Critical reading							
All students	503	502	502	501	501	497	496
Mexican American	454	455	454	453	454	451	448
Puerto Rican	459	459	456	452	454	452	452
Other Hispanic	458	459	455	455	454	451	447
SAT—Mathematics							
All students	518	515	515	515	516	514	514
Mexican American	465	466	463	463	467	466	465
Puerto Rican	456	454	453	450	452	452	452
Other Hispanic	463	463	461	461	462	462	461
SAT—Writing							
All students	497	494	494	493	492	489	488
Mexican American	452	450	447	446	448	445	443
Puerto Rican	448	447	445	443	443	442	442
Other Hispanic	450	450	448	448	447	444	442

One possible explanation for the weaker academic performance on SAT score of Hispanics compared to non-Hispanics could be due to language differences between Hispanics and non-Hispanics. Hattiangadi (2004) found that 78 percent of the U.S.

Hispanic population speaks Spanish at home. Taken from the report, Figure 4 shows that among them a majority of those who do speak Spanish at home reported that they do not speak English "very well." Hattiangadi (2004) equates this to over 13 million Hispanics who have some difficulty speaking English and also found the highest percentage of non-English speaking households resided in California, Texas, and New Mexico and Spanish was the primary foreign language spoken.
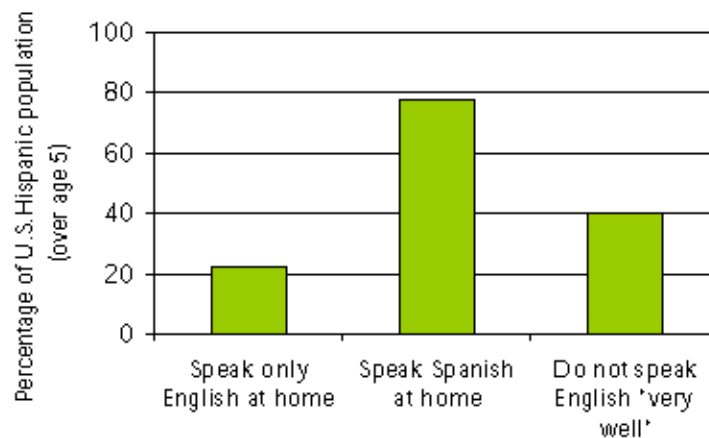
Figure 4.   Language Preferences and Abilities of the U.S. Hispanic Population
(from Hattiangadi,2004)

Citizenship status is another important factor that distinguishes Hispanics from non-Hispanics. According to 2011 U.S. census data found at (http://www.census.gov/population/hispanic/data/2011.html), 64 percent of Hispanics in the United States are citizens at birth while 12.3 million or 24.7 percent of all Hispanics in 2011 were foreign-born non-citizens which may explain portions of the growth in the Hispanic population. Non-citizens may serve in the Armed Forces if they establish permanent residency in the U.S. by obtaining a Green Card (McIntosh, 2011). According to the U.S. Homeland Security website (http://www.uscis.gov/news/fact-sheets/naturalization-through-military-service-fact-sheet), over 100,000 non-U.S. citizens have served in the U.S. military since 2002.

C.   MARINE CORPS OFFICER ACCESSION SOURCES

10 U.S. Code § 532, (2004) requires that original appointment as a commissioned officer under regulations prescribed by the Secretary of Defense in the Regular Army, Regular Navy, Regular Air Force, or Regular Marine Corps may be given only to a person who:

1.   is a citizen of the United States;
2.   is able to complete 20 years of active commissioned service before his sixty-second birthday;
3.   is of good moral character;
4.   is physically qualified for active service; and
5.   has such other special qualifications as the Secretary of the military department concerned may prescribe by regulation.

The fifth bullet gives the Secretary of the Navy the authority to add college education requirements for newly commissioned officers in the Navy and Marine Corps. However, Gilroy et al., (1997) (1997) found that in the Marine Corps there are a few cases where some non-college graduates have an opportunity to attain an officer's commission. Gilroy et al., (1997) reported that there are opportunities for these rare cases but nearly all newly commissioned officers have an appropriate college degree.

With college education as one of the key requirements for civilians to attain a commission in the Marine Corps, most accession sources are closely tied to the college community. Ergun (2003) found that of the seven sources that access Marine Corps officers, most are designed around college students or graduates. The report explains that the service academies are military funded and operated colleges that incorporate the academic requirements of college in with military acculturation and training. The Naval Academy (USNA) in Annapolis, MD is the primary service academy that feeds into the Marine Corps. Ergun (2003) also found that the Naval Reserve Officers' Training Corps (NROTC) programs accomplish similar acculturation and training but do so at public and private civilian colleges. The Platoon Leader's Course (PLC) and the Officer Candidate Course (OCC) are programs that access candidates who have no military obligations during or after their college courses but who attend Officer Candidate School (OCS) for their training (Ergun, 2003).

Ergun, (2003) details the last three sources of programs for personnel with prior military service. The report explains the Marine Corps Enlisted Commissioning Program (MECEP), Enlisted Commissioning Program (ECP), and the Meritorious Commissioning Program (MCP) either send qualified enlisted personnel to accredited colleges followed by a shortened OCS assessment or directly to OCS if a college degree has already been attained. The report also reports that candidates from each source, with the exception of the USNA, attend OCS for varying lengths prior to their commissioning.

The NROTC and USNA accession sources provide scholarships and extensive support staff (Ergun, 2003) that make acceptance competitive. For example, Barron's *Profiles of American Colleges* provides selectivity ranking that considers the Naval Academy "most competitive" due to the limited number of entrants in comparison to those that apply. While each source requires similar physical and medical standards, in addition to physical fitness tests, NROTC and USNA have academically higher selectivity requirements based in part on higher SAT scores (Gilroy et al., 1997). According to Gilroy (1997), the average combined math and verbal SAT score for USNA students in 1997 was 1237 in comparison to the average of 900 for students nationwide.
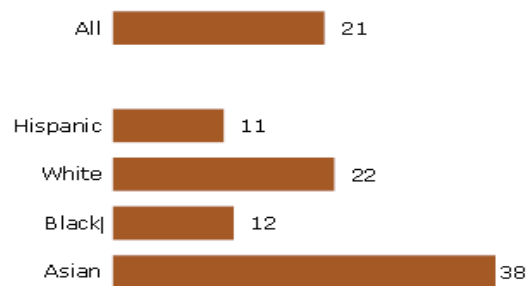
Figure 5.   Share of 22- to 24-Year-Olds Completing at Least a Bachelor's
(after Fry, 2012)

As previously discussed, college attendance rates of the Hispanic population are similar to that of non-Hispanics. According to Fry (2012), college completion with a four-year degree, however, is quite different for Hispanics and non-Hispanics. This report shows, as can be seen in Figure 5 above, that Hispanics complete college at a lower rate than other race or ethnic groups. Additionally, Fry (2012) finds that Hispanic college

students enrolled in four-year colleges at a rate of 56percent, compared to 72percent of whites. Also, Hispanics are less likely to attend selective colleges than whites (Bozick & Lauff, 2007).
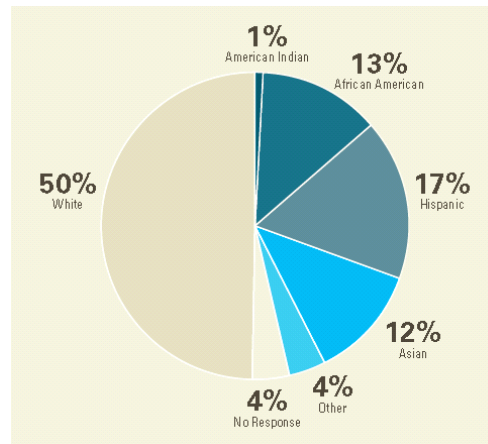
Figure 6.   SAT Participation by Race and Ethnic Group
(from www.collegeboard.org/sites/default/files/sat-
report-college-career-readiness-2013.pdf)

One probable explanation for the lower college completion rates is the low rates of SAT participation and performance by Hispanics. According to Collegeboard.org's website   (www.collegeboard.org/sites/default/files/sat-report-college-career-readiness-2013.pdf), minority students made up 46 percent of the SAT takers in the class of 2013. As seen in Figure 6 above, Hispanics accounted for 17 percent of the total number of SAT takers but only 23.5 percent of Hispanics who completed the SAT test achieved scores that met or exceeded the benchmark for college entry. In addition, Collegeboard.org found that:

> College Board data shows that underrepresented minority and low-income students are less likely to complete a core curriculum, less likely to pursue more advanced honors or AP course work, and less likely to report a GPA equivalent to an A.

D.   THE BASIC SCHOOL

Following the completion of college and Officer Candidate School (OCS), all newly commissioned officers attend the Basic Officer Course (BOC) in Quantico,

Virginia (Ergun, 2003). This course is hosted by The Basic School (TBS) which is a subcomponent of the Marine Corps' Training and Education Command. According to the TBS website (http://www.trngcmd.marines.mil/Units/Northeast/TheBasicSchool.aspx), their goal for is to instill in the graduates the character, leadership, communication, mental and physical traits expected of all Marine Corps officers. At the completion of this 26-week program of instruction (POI), all graduates are ranked and assigned to attend their Military Occupational Specialties training.

Ergun (2003) outlines the details of TBS' BOC courses which are run year-around and are conducted in eight groups of approximately 200 officers. According to the report, each group is called a "company" and is differentiated by letters. For instance, "A" or Alpha company is the first course of the fiscal year and commences in November and concludes in June. The report details how each subsequent course starts approximately two months after the previous course. The staff for each company consists of a Commanding Officer, Executive Officer and Company First Sergeant, and Company Gunnery Sergeant (Ergun, 2003). Additionally, each company is broken down into six platoons of approximately 30 officers that are led by a Staff Platoon Commander (SPC).

In addition to the student companies, there is an Instructor Battalion that consists of support personnel that aid in the training and education of the BOC officers. These instructors are subject matter experts in their fields and lead the POIs that each student receives. Each student company Commanding Officer and the Instructor Battalion Commander reports to the commanding officer of TBS.

As seen in Figure 7 below, the BOC's 26 weeks of instruction is divided into four phases (K. Mills, personal communications, 6 January, 2015). The first phase lasts six weeks and focuses on Individual Skills such as Leadership Fundamentals, Martial Arts Training, Pistol and Rifle Marksmanship training, and an introduction to land navigation. Each phase is designed to build upon the last phase to allow for progression in skills and knowledge of the more advanced areas seen in the later phases. Phase 2 and 3 are also six weeks in length and focuses on Decision-Making and Squad Objectives and Rifle Platoon Commander Skills. The final phase is on Basic Marine Air-Ground Task Force (MAGTF) Officer Skills and last 8 weeks.

- **Phase I (6 weeks): Individual Skills**
  - Leadership Fundamentals Introduction
  - Marine Corps Martial Arts (Tan Belt)
  - Rifle and Pistol Qualification
  - Land Navigation Introduction
  - Basic Communications
  - Combat Lifesaving
  - International Officer Country Brief/Social Event
  - *Introduction to Amphibious Operations*
  - Spouses Orientation/Family Social Event
  - L.I.N.K.S. for Spouses Workshop
- **Phase II (6 weeks): Decision-Making and Squad Objectives**
  - Tactical Planning & Combat Orders
  - Rifle Squad Weapons & Tactics
  - Patrolling & Supporting Arms
  - Platoon Commander's Administration
  - **MOS Information Briefings**
  - *Amphibious Operations II*
  - Life Skills Workshops/4 Lenses/PLT Social Event

- **Phase III (6 weeks): Rifle Platoon Commander Skills**
  - Rifle Platoon Tactics
  - Engineering/Crew-served Weapons
  - Rifle Platoon (Reinforced) Tactics
  - *Amphibious Planning*
  - Family Care Plan Workshop/CO Social Event
- **Phase IV (8 weeks): Basic MAGTF Officer Skills**
  - **Military Occupational Specialty Selection**
  - MAGTF Combined Arms
  - MAGTF Expeditionary Operations
  - *Littoral Maneuver & Contemporary Marine Corps Amphibious Operations*
  - *Final Field Exercise – 7 Day "War"*
  - **MAGTF Night**
  - Permanent Change of Station Town Hall
  - CG, MCCDC Spouse's Student Spouse Dinner
  - Tour of the Home of the Commandants
  - Graduation Ceremony

Figure 7.   TBS Training Phases
(from K. Mills, personal correspondence, 6 January, 2015)

The 26 weeks of instruction provides 1,400 hours of lessons that typically begin in a classroom environment that are taught by one of the Instructors from the Instructor Battalion. The instruction then moves to a hands-on environment such as a sand table and/or small group discussion where more interaction between students and instructor can be obtained. The culminating point for instruction will be with a field exercise where the students can demonstrate their understanding and application of the lessons learned in the POI.

Officers attending TBS' BOC are evaluated on their performance in military skills, academics, and leadership. Military skills and academics each make up 30 percent of a student's grade and leadership makes up the last 40 percent (K. Mills, personal correspondence, 6 January, 2015). Military skills are primarily physical training events such as an endurance and obstacle course, weapons qualifications, and land navigation. The academic evaluation consists of ten individually graded events taken throughout the four phases of the 26 weeks of instruction. Each phase has two exams and there is an additional Review Exam and a Platoon Commander Admin Exam. Table 4 below provides an example of the content of an exam that counts toward the final academic score:

Table 4.   TBS Phase I Exam I Content
(from K. Mills, personal communication, 6 January, 2015)

Phase I Exam I
Weight: 2.5, Time: 100 min, # of Qs: 60
B030096 Military Correspondence
B0X0256 Uniforms
B130615 Role of Chaplain
B130786 Operational Risk Management
B130836 Operational Terms and Graphics
B130876 Warfighting
B130916 Human Factors
B130936 Law of War/Introduction to Rules of Engagement
B141036 Personal and Family Readiness
B141136 Responsibilities of the Interior Guard
B141176 Security of Classified Materials
B155456 Antiterrorism and Force Protection
B1K0992 Financial Management
B1X0776 USMC Counseling and Mentoring
B1X0856 Officership Foundations

In personal correspondence with the Academics department at TBS, it was stated that the leadership evaluation carries the most weight with 40 percent of the overall grade. There are five graded leadership events of which four are evaluations and one examination. Two evaluations come directly from the student's SPC and are based on the student's performance in numerous garrison and tactical billets as well as several peer evaluations. The first leadership evaluation does not count toward a student's overall grade. The intent of the first evaluation is to provide the student with an understanding of what is to be expected of them in the following evaluations. The second leadership evaluation accounts for eight percent of the overall grade and 20 percent of the leadership grade. The remaining third and fourth evaluations carry increased weight as the students are expected to show personal and professional growth as they proceed throughout the 26 week course.

The SPC is responsible for assigning the leadership evaluations based their own assessment and an assessment from a student's peers within the platoon. The SPC assessment weighs 90 percent toward the leadership grades and the remaining ten percent

is based on the peer evaluations. Peer evaluations are assigned by ranking one's peers in his or her platoon from first to last. Students do not include themselves in the rankings of their peers.

With several graded events within each of the three evaluated areas of the BOC, a grade point average (GPA) is calculated for each student. GPAs are based on overall performance and on individual areas of instruction (K. Mills, personal correspondence, 6 January, 2015). Students can therefore look at their overall performance in addition to their performance in the individual areas of military skills, academics and leadership. Once individual GPAs are calculated, class ranking of the students are assigned based on their performance in comparison to their peers. In addition to the class ranking, a class is divided into top, middle and bottom thirds in order to attain a quality spread during Military Occupational Specialty (MOS) assignment.

MOS assignments at TBS are conducted by weighing the top five preferences of each student against billet vacancies that are distributed evenly across the three tiers. The MOS' assigned to each tier are all that an officer can bid for in his MOS selection. For example, if there are five billet vacancies in a particular MOS, two are assigned to the top and middle tiers and one is assigned to the bottom. Once a billet is no longer available within that tier, an optimization program automatically assigns the next MOS preference available in that tier. Continuing with our example, if the top three performing officers who are all in the top tier prefer the same MOS and only two are assigned to that tier, the third best performing student in the entire company will not get his top choice MOS. Rather, the highest ranked person in the middle tier who prefers the same MOS will receive that MOS despite being outperformed by approximately 60 other students.

According to the Wiler and Hurndon (2008), a student's performance at TBS has potential impact on later career outcomes due to the assignment of lineal numbers that determine the order in which promotions are given. According to this report, the lineal numbers are based on date of rank and TBS performance. Therefore, if two individuals are commissioned on the same day, the officer that receives a higher TBS ranking will have a lower lineal precedence number than the other. Since lineal numbers are directly

related to an officer's seniority, the officer's promotion eligibility and date of promotion are affected.

E.   THE PERFORMANCE EVALUATION SYSTEM

Headquarters Marine Corps (2010) is the Marine Corps' instruction known as the Performance Evaluation System (PES) Manual. This instruction provides guidance on how fitness reports are to be used in the Marine Corps. The Marine Corps utilizes fitness reports as the primary tool to evaluate the performance of individuals. Not only does it aid the individual with their career progress and growth but the entire organization since it allows for individuals to be compared to one another. More specifically from the PES manual (Headquarters Marine Corps, 2010, p. 2) states:

> The fitness report provides the primary means for evaluating a Marine's performance to support the Commandant's efforts to select the best qualified personnel for promotion, augmentation, retention, resident schooling, command, and duty assignments. The completion of fitness reports is a critical leadership responsibility. Inherent in this duty is the commitment of our commanders and all reporting officials to ensure the integrity of the system by giving close attention to accurate marking, narrative assessment, and timely reporting. Every commander and reporting official must ensure the scrupulous maintenance of the PES. Inaccurate evaluations only serve to dilute the actual value of each report.

To ensure standardization and thoroughness in reporting, the PES provides detailed instructions regarding requirements for the submission of fitness reports. The PES establishes the relationships and requirements between the Marine Reported on (MRO) and the Reporting Senior (RS) who acts as the first person within the MROs chain of command. Additionally, the PES establishes the role of the Reviewing Officer (RO) who acts as a third party to ensure all parties are abiding by the procedures within the PES and to add an alternate evaluation of the MRO. The objective of this design is to ensure Marines from the grade of sergeant through major general receive appropriate evaluations for every primary billet they hold.

As seen in Table 5, the PES establishes 13 different occasions in which fitness reports are to be used in the performance evaluation of MROs. If more than one occasion occurs simultaneously, precedence shall be taken by the occasion that is higher on the

list. For example, a MRO who is promoted and changes their RS during the same period will receive a Grade Change fitness report since it appears higher on the list and therefore has a higher priority.

Table 5.   PES Manual Fitness Report Occasions (from Headquarters Marine Corps, 2010)

```
Occasion                            Code

Grade Change                        GC
CMC Directed                        DC
Change of Reporting Senior          CH
Transfer                            TR
Change of Duty                      CD
To Temporary Duty                   TD
From Temporary Duty                 FD
End of Service                      EN
Change in Status                    CS
Annual (Active Component)           AN
Annual (Reserve Component)          AR
Semiannual (lieutenants only)       SA
Reserve Training                    RT
```

In any occasion, fitness reports are to be considered either observed or non-observed. If the fitness reporting period is 89 days or less or the RS has insufficient observation time, the report shall be considered non-observed. RSs are required to submit observed fitness reports if the reporting occasion period is longer than 90 days. The intent is to ensure that the MRO is graded fairly based on performance that can be demonstrated to the RS in a sufficient period.

The RS's role in the PES and the effect of the PES on the MRO's career are both very important. Therefore, RSs are normally assigned to commissioned officers. In some cases civilians and warrant officers are assigned and in even fewer cases staff noncommissioned officers are used as an RS. The PES conveys the importance in the RS's role by stating, "The RS must establish and clearly convey duties and responsibilities to the MRO and observe, evaluate, and accurately report on the Marine's performance, professional qualities, and potential" (Headquarters Marine Corps, 2010, p. 2–3) "Inherent in this duty is the commitment of the RS to preserve the integrity of the

PES by having the moral courage to report with the utmost accuracy" (Headquarters Marine Corps, 2010, p. 2–4).

The PES manual requires that the RS be responsible for forwarding fitness reports to the RO in addition to counseling the MRO throughout the period covered. The RO is similar to the RS in that he is within the MRO's chain of command and is responsible for evaluating the MRO's performance. In addition to these tasks the PES manual states that the RO should be the first person in the RS's chain of command, and he or she should be responsible for tasking, supervising, and evaluating the RS. The RO ensures that the RS is observing the instructions of the PES manual and the overall objective of the PES.

Appendix A contains a copy of the fitness report form in use since 1999 with the issuance of the PES Manual. The fitness report has five pages with 12 sections labeled A through L. Descriptive information about the MRO is in section A. This information includes name, grade, date of rank, Primary Military Occupational Specialty (PMOS), height, weight, Physical or Combat Fitness Test score, rifle and pistol scores received or measured during this period. Also included is information regarding the organization the MRO is assigned to, reporting occasion, period covered, duty preference of the MRO, recommendation for promotion, and identifies the RS and RO.

Sections B and C of the fitness report are for billet description and accomplishments. The MRO usually fills in these sections with the RS in order to match the tasks and accomplishments that have been discussed between the two prior to the end of the reporting period. Section C should highlight the key accomplishments during the reporting period and should be the primary basis for the marks given in the subsequent sections.

Sections D through H are divided into five sections that cover mission accomplishment, individual character, leadership, intellect and wisdom, and fulfillment of evaluation responsibilities. The RS evaluates the MRO on each of these sections by selecting one of eight possible selections. The PES manual states that the RS should ask themselves prior to filling in sections D through H the following question, "On the basis of the duties I assigned over the course of this reporting period, how well did the MRO

perform?" (Headquarters Marine Corps, 2010, p. 4–24). The question is intended to ensure that the RS adequately considers the appropriate selections since the final marks are converted to a numerical grade and therefore have large significance in the final results of the fitness report.

The eight possible grades the RS can select are A through H. Each letter option has an associated definition that aids the RS in selecting the best fit option on how the MRO performed, fulfilled, or embodied that trait during the reporting period. An "A" has the lowest weighted value while "G" has the highest. An "A" marking in any category requires the report to be considered adverse which has extreme negative significance. Because of the extreme values that both "A" and "G" markings carry they are considered rare and require substantial rationale and justification when assigned. Block H does not factor into the calculation of the average.

The numerical values assigned to each letter mark create a fitness report average. "The average of the observed attributes reflects the mean of the numeric value for all observed attributes on that report" (Headquarters Marine Corps, 2010, p. G-1). The fitness report average allows for the calculation and tracking of the RS's average of all fitness reports written on Marines of similar grade. Additionally, the RS's highest fitness report average of any report written on Marines of a similar grade can be used as a metric to compare the current MRO to his peers. Several grades are generated from fitness report scores and among them are, "mean of the numeric value for all fitness reports written by the RS on Marines of a similar grade…[and] the highest fitness report average of any report written by the RS on Marines of similar grade" (Headquarters Marine Corps, 2010, p. G-1). These values enable the calculation of a relative value that "reflect how the fitness report average of an individual report compares to the RS's average of all fitness reports written by the RS on Marines of the same grade [and] the highest fitness report average of any report written by the RS on a Marine of the same grade as the MRO" (Headquarters Marine Corps, 2010 CH1-2, p. G-2). Additionally, a cumulative relative value can be calculated which reflects the cumulative relative value of the MRO's fitness report based on the RS's rating history for Marines of the same grade as the MRO. Over time, as the RS writes additional reports on new MROs of the same

grade, the cumulative relative value changes. Therefore, a third possible calculation is derived based on the cumulative relative value score at a particular time, such as at processing or during a board that is considering a MRO for promotion.

Section I of the fitness report gives an RS the opportunity to provide a written narrative on additional information not conveyed or expressed adequately in the previous sections. The "word picture" that section I provides allows for further scrutiny and comparison of one report to another. The RS also uses the space in this section to enter mandatory, directed, and additional comments. The PES manual describes these comments as (Headquarters Marine Corps, 2010 CH1-2, p. 4–39):

- Mandatory comments are those required to give the CMC a more complete picture of the MRO's professional character.
- Directed comments as required by this manual, provide the CMC amplifying information concerning the MRO.
- Additional comments may span a wide variety of events, accomplishments, or activities that the RS deems important to convey to the CMC.

Section J is the signature and date section. RSs are required to provide either a hand-written signature or an electronic-signature and date in this section. Adverse reports require the MRO to sign the report in addition to the RS.

Section K allows the RO to indicate if there is sufficient observation time to consider the report observed or unobserved. Additionally, section K allows an opportunity to provide supporting or non-concurring narrative on the RS's evaluation of the MRO. With sufficient observation time, ROs are required to grade the MRO's performance on a seven point scale referred to as the "Christmas Tree." The scale has eight possible choices and varies from "unsatisfactory" to "eminently qualified." The RO's narrative should match or amplify the "Christmas Tree" marks and provide comments that assess the MRO's potential for promotion, command, assignment, resident professional military education, and retention. Finally, the RO's comments should provide a separate viewpoint from those of the RS's evaluation which provides additional perspective to the PES.

Section L is the last section of the fitness report and provides an addendum to the fitness report if required. Addendums are not required unless there is narrative that does not fit in the space provide in sections I and K such as in the case of an adverse report. Additionally, when high marking are given in sections D through H that need further justification that exceed the section I comments space provided.

III. LITERATURE REVIEW

A. OVERVIEW

Prior research on the performance and promotion of minorities in the United States military are extensive and comprise both academic and government publications. The criteria for the literature review primarily included prior studies in the area of performance and promotion. This literature review discusses the background, sources of data, and the econometric models estimated in each study.

B. THE SIGNIFICANCE OF THE FITNESS REPORT

Garza (2014) examined the potential factors that impacted whether or not junior officers in the Marine Corps where offered the opportunity to continue their careers on active duty beyond their initial contracts. This process, referred to as Career Designation (CD), is a competitive process that USMC manpower planners utilize to shape the force in order to match varying demands and constraints. Senior officers are bi-annually assigned to review the records of eligible candidates and to make recommendations on final selections. CD occurs prior to an officer's eligibility for promotion to the rank of Major (O4) and the factors that are evaluated during each CD board are similar to those reviewed during a promotion board.

Garza analyzed data on a population of 6,732 officers who were reviewed for CD from 2010 through 2013. Over these four years, eight separate boards of senior officers met to select the "best and fully qualified" for career designation. Eligibility was determined by Manpower Management Officer Assignments (MMOA) based on the criteria that the officers had been considered for promotion to Captain and had accrued 540 days of observed fitness report time in their primary MOS. After eligibility was determined, the CD board analyzed summary data from an individual's entire career.

Garza's statistical model estimated the effect of independent variables in five categories on CD selection. The dependent variable reflected selection or non-selection, thus a probit estimation model was used. CD selection was estimated as a function of an individual's demographic characteristics, commissioning source, Military Occupational

Specialty (MOS), career performance and experience. Demographic characteristics consisted of an individual's years of commissioned service, years of total service, gender, race/ethnicity, marital status, dependents, and education. The commissioning sources were the Enlisted Commissioning Programs, Naval Reserve Officer Training Corps (NROTC), Officer Candidate Course (OCC), Platoon Leaders Course (PLC) and the Naval Academy. Garza grouped 45 individual MOSs into five categories: combat arms, combat service support, Air, Air Ground and Law. Prior performance and aptitude as a junior officer was measured through an individual's General Technical score (GCT), weapons qualification scores, physical fitness scores, swim qualification scores and fitness report scores earned throughout their career.

Garza estimated separate CD selection models for each of the five different MOS groups. For each group he estimated five different model specifications. Model 1 included only basic demographic characteristics and served as the baseline model. Each subsequent model added other categories of variables such as commissioning program (Model 2), specific MOS (Model 3), GCT score (Model 4), and fitness report scores (Model 5). Table 6 shows the specifications of the five models. Also, Garza estimated all of the models for two different periods, 2010–2012 and 2013.

Table 6.   Career Designation Estimation Models (after Garza, 2014)

Model 1: P(**Selected)** = G(B0 +B1 **demographics**)
Model 2: P(**Selected**) = G(B0 +B1 *demographics* + B2 *commissioning*)
Model 3: P(**Selected**) = G(B0 +B1 *demographics* + B2 *commissioning* + B3 *MOS*)
Model 4: P(**Selected**) = G(B0 +B1 *demographics* + B2 *commissioning* + B3 *MOS* + B4 *GCT score*)
Model 5: P(**Selected**) = G(B0 +B1 *demographics* + B2 *commissioning* + B3 *MOS* + B4 *GCT score* + B5 *experience*)

As shown in Table 7 and 8, the results found that the coefficients associated with the Hispanic variable were generally insignificant. The only exception was for the Combat Service Support MOS category, where Hispanics were less likely to be selected. The magnitude of the effect ranged from -16 to -11 percentage points for the models for

FY2012-2013 and from -13 to -10 points for the FY 2010–2013 model. Also, Garza found that fitness report values given by each individual's Reviewing Senior were highly significant factors in predicting the probability of Career Designation. Additionally, the number of combat deployments that each individual completed was also a significant predictor of successful Career Designation but was not consistent across occupational specialties.

Table 7.   CSS Competitive Category Model Results (after Garza, 2014)

Combat Service Support Competitive Category					
Models	(1)	(2)	(3)	(4)	(5)
Dependent Variable = Selected for Career Designation					
Female	0.1083***	0.0945***	0.1119***	0.0760**	0.0798**
	(0.0244)	(0.0257)	(0.0258)	(0.0340)	(0.0339)
Black	-0.1332***	-0.1464***	-0.1284***	-0.0305	-0.0302
	(0.0433)	(0.0444)	(0.0446)	(0.0555)	(0.0555)
Hispanic	-0.1333***	-0.1434***	-0.1290***	-0.0962**	-0.1032**
	(0.0464)	(0.0468)	(0.0477)	(0.0628)	(0.0632)
	Standard Errors in Parantheses				
	*** Significant at 1%, ** Significant at 5%, * Significant at 10%				

Table 8.   CSS Category FY(12) Round 1 through FY(13) Round 2 Model Results (after Garza, 2014)

Combat Service Support Competitive Category FY(12) Round 1 through FY(13) Round 2					
Models	(1)	(2)	(3)	(4)	(5)
Dependent Variable = Selected for Career Designation					
Female	0.1064***	0.1043***	0.1158***	0.0566	0.0593
	(0.0368)	(0.0380)	(0.0388)	(0.0534)	(0.0534)
Black	-0.2083***	-0.2048***	-0.2002***	-0.0751	-0.0845
	(0.0590)	(0.0597)	(0.0606)	(0.0826)	(0.0831)
Hispanic	-0.1648***	-0.1762***	-0.1642***	-0.1141*	-0.1100*
	(0.0464)	(0.0468)	(0.0477)	(0.0628)	(0.0632)
	Standard Errors in Parantheses				
	*** Significant at 1%, ** Significant at 5%, * Significant at 10%				

C.   THE SIGNIFICANCE OF COLLEGE EDUCATION

Bowman and Mehay (2002) analyzed the impact of college quality, as measured by Barron's *Profiles of American Colleges,* on the job performance of a cadre of U.S.

Navy officers. The authors also sought to analyze the performance effect of attending private versus public universities. Although Bowman and Mehay used data on Navy Officers, their analysis of the performance of officers who are within the first ten years of their careers is valuable to this literature review. Similar to Garza (2014), the authors measured performance as a function of fitness report scores. Bowman and Mehay expand on this by utilizing the "recommended for early promotion" variable with in the Navy fitness reports and also separately measured performance based on successful selection for promotion. The authors measure of performance is calculated as the percentage of their annual fitness reports that received a recommendation for early promotion. Descriptive statistics indicated that 35 to 38 percent of officers in pay grades O1 through O2 received this recommendation and 69 to 73 percent in grade O3.

Bowman and Mehay applied labor economics theories that relate job performance to an individual's cognitive skills. The authors used ordinary least square (OLS) models to estimate fitness report percentile scores as a function of cognitive skills, commissioning source, and individual demographics. Barron's rankings of each college, the individual's GPA, and college major field of study were the proxies for cognitive skills. Race, gender, dependents, and age were the demographic variables.

In addition to the OLS models, the authors used multivariate probit models for estimating successful selection for promotion to the grade of O4. Promotion selection was estimated as a function of the same independent variables used in the model of fitness report percentile scores. Additional variations in the models consisted of interaction terms with college selectivity with private or public institutional ownership.

Bowman and Mehay used data on 27,604 Navy officers who graduated from over 1,000 different colleges from 1976 to 1985. The models of performance evaluation scores were estimated for pay grades from O1 through O2 and then for pay grade O3. Performance as measured by promotion to O4 for those who survived to the 10-year of service mark. MOS was considered by running each model separately for two occupational specialties; operational or line and staff officers. Barron's six college selectivity rankings were further regrouped by Bowman and Mehay into three groups (Top, Middle and Bottom-rated).

As shown in Table 9, the results found that college GPA for line officers had a large positive effect on fitness report scores. Additionally, graduates from top-rated colleges (private or public) received higher performance marks in the O1 through O2 pay grades than those from the lowest rated colleges for line specialties. While the effect of being from a top or middle-rated college on those in the O3 grade who stayed to 10 years was positive, the results were statistically insignificant for those who attended a public college.

Table 9. Career Performance Estimates (after Bowman & Mehay, 2002)

	Outcome Variables				Outcome Variables		
Variable	Performance Evaluations, Grade 1-2	Performance Evaluations, Grade 3	Grade 4 Promotion Probit	Variable	Performance Evaluations, Grade 1-2	Performance Evaluations, Grade 3	Grade 4 Promotion Probit
Top-Rated Private	.089*** (.015)	.086*** (.014)	.161** (.078) [.049]	Age	-.003* (.001)	-.001 (.001)	-.065*** (.008)
Middle-Rated Private	.020 (.014)	.039*** (.013)	.044 (.069) [.013]	Married	.090*** (.010)	.032*** (.009)	.221*** (.047)
Bottom-Rated Private	-.003 (.025)	-.022 (.022)	-.238** (.111) [-.073]	Married and Children	.108*** (.007)	.049*** (.008)	.318*** (.041)
Top-Rated Public	.042** (.018)	.014 (.016)	.074 (.089) [.021]	Unmarried and Children	.064* (.034)	-.002 (.024)	.064 (.121)
Middle-Rated Public	.016 (.011)	.013 (.010)	.049 (.053) [.015]	African-American	-.065*** (.018)	-.048*** (.017)	-.117 (.086)
Engineering Major	.015 (.010)	.003 (.008)	.043 (.047)	Other Minority	-.030 (.022)	-.018 (.021)	-.140 (.108)
Science Major	-.043*** (.011)	-.043*** (.011)	.037 (.063)	Female	.058** (.027)	.013 (.026)	.605** (.161)
Math Major	-.021 (.013)	.034*** (.003)	.148*** (.017)	Intercept	.205	.585	1.643
Business Major	.018 (.011)	.011 (.009)	.126** (.053)	N	14,862	8,895	7,946
Humanities Major	-.029** (.013)	-.014 (.012)	-.092 (.064)	R^2	.040	.038	---
GPA	.054*** (.003)	.041*** (.003)	.155*** (.016)	-2 Log L	---	---	8,586.08
Joint Hypothesis Tests							
College Majors	<.0001	<.0001	.0036	Marital Status*Female	.8012	.5369	.6933
College Selectivity*Female	.8046	.6972	.6896	Marital Status*Af.Am	.7664	.4083	.4949
College Selectivity*Af. Am.	.2638	.9201	.9731				

Bowman and Mehay (2002) highlight the effects of academic achievement, college major and college quality on U.S. Navy officer job performance. They concluded that the positive relationship between academic background and higher job performance ratings throughout an individual's career leads to a greater likelihood that the individual would be promoted. Most importantly, the authors provide strong statistical evidence to

include pre-commissioning variables such as individual college selectivity and achievement (GPA) in future studies that model officer performance.

D.   THE SIGNIFICANCE OF TBS

Wiler and Hurndon (2008) analyzed the impact of Marine Corps officer performance during initial training and education at The Basic School (TBS) on their performance as junior officers in the operating forces. The authors sought to provide the Marine Corps with a statistical basis from which to analyze its current evaluation process of officer performance at TBS. The authors looked for potential relationships between an officer's given lineal standing at completion of TBS with future success in the operating forces in order to determine if the metrics used to measure performance at TBS are adequate for predicting future performance.

All Marine Corps officers attend TBS in order to provide initial training and education on the fundamental aspects expected of all officers. As students at TBS, all officers are evaluated throughout the course in three primary areas: Leadership, Academics, and Military Skills. Individual events are graded to establish categorical and overall grade point averages for all students. The grades are used to rank each student and eventually are used to assign lineal numbers to each. Lineal numbers are based on seniority as measured by date of commission. If multiple officers share the same commissioning date, lineal numbers generated through TBS class performance are used to differentiate them. Lineal numbers remain with each officer throughout their career and dictate the order in which promotions are made. Additionally, each officer who completes TBS is placed within one of three tier groups based on their overall TBS ranking. Future occupational selections for all non-contract officers are based on their position within each tier group.

Wiler and Hurndon quantified officer performance in the operating forces through relative value scores that are given to them by their Reporting Seniors (RS) and Reviewing Officers (RO) in their periodic fitness report evaluations.

> [Relative values] reflect how the fitness report average of an individual report compares to the RS's average of all fitness reports written by the

RS on Marines of the same grade [and] the highest fitness report average of any report written by the RS on a Marine of the same grade as the [Marine reported on] MRO (MCO1610.7F, 2006, p. G-2). The cumulative relative value reflects the cumulative relative value of the MRO's fitness report based on the RS's rating history for Marines of the same grade as the MRO. This number is variable and will change as the RS writes additional reports on Marines of the same grade as the MRO. (MCO1610.7F, 2006, p. G-2)

Wiler and Hurndon specified six different multivariate OLS statistical models to estimate relative values scores. The need for six different models was necessary to avoid collinearity problems among the independent variables. For example, some commissioning sources are entirely filled by prior enlisted Marines. Including a "prior enlisted" variable with these commissioning sources in the same model would affect the coefficient's values.

Using a population of newly commissioned Marine Corps officers from 1998 through 2005, relative value fitness report scores received as junior officers after completing TBS were estimated as a function of various TBS performance metrics, commissioning sources, and individual demographic characteristics. Below is a list of all the independent variables utilized in the six models:

- **Model #1** - Academic Rank, Leadership Rank, Military Skills Rank, Other MOS, Female, OCC, NROTC, MECEP, ECP, USNA, MCP, Age at First Commission, Black, Other Race, Married, Divorced, Widowed.
- **Model #2** - Academic Rank, Leadership Rank, Military Skills Rank, Other MOS, Female, Prior Enlisted Marine, Age at First Commission, Black, Other Race, Married, Divorced, Widowed.
- **Model #3** - Top Third Performer, Bottom Third Performer, Other MOS, Female, OCC, NROTC, MECEP, ECP, USNA, MCP, Age at First Commission, Black, Other Race, Married, Divorced, Widowed.
- **Model #4** - Top Third Performer, Bottom Third Performer, Other MOS, Female, Prior Enlisted Marine, Age at First Commission, Black, Other Race, Married, Divorced, Widowed.
- **Model #5** - Final Overall Class Rank, Other MOS, Female, OCC, NROTC, MECEP, ECP, USNA, MCP, Age at First Commission, Black, Other Race, Married, Divorced, Widowed.
- **Model #6** - Final Overall Class Rank, Other MOS, Female, Prior Enlisted Marine, Age at First Commission, Black, Other Race, Married, Divorced, Widowed.

In addition to the unrestricted models listed above, Wiler and Hurndon restricted the samples for the models by deleting contract aviators. The premise was to separate those that already had an MOS assigned to them prior to attending TBS. For all non-contract officers attending TBS, MOS assignments are based on MOS vacancy, individual preference, lineal standing and assigned tier. Contract officers lack the same incentive to perform well at TBS as non-contract officers and therefore were removed to eliminate potential bias in the models results.

The results showed that all but one of the explanatory variables was statistically significant. Table 10 provides a summary of the variables that were significant with asterisks that indicate at what level the variable was significant: *** means that the variable was statistically significant at the 1percent level for that particular model, ** is significant at the .05 level, and * is significant at the .10 level.

Table 10.   Statistically Significant Predictors (after Wiler & Hurndon, 2008)

Variable	Model #1		Model #2		Model #3		Model #4		Model #5		Model #6	
	U	R	U	R	U	R	U	R	U	R	U	R
Academics	***	***	***	***								
Leadership	***	***	***	***								
Top Third					***	***	***	***				
Bottom Third					***	***	***	***				
Final Ranking									***	***	***	***
MOS Pref		*		*		*		**				
OCC	*	***			*	***			*	***		
NROTC	**	**			***	***			***	***		
MECEP	***	***			***	***			***	***		
ECP	*	**			**	**			*	*		
USNA	**	***			***	***			***	***		
MCP	*	*			***	***			***	***		
Female	***	***	***	***	***	***	***	***	***	***	***	***
Prior Enlisted			***	***			***	***			***	***
Age							**	**			*	*
Black	***	***	***	***	***	***	***	***	**	***	**	***
Married	***	***	***	***	***	***	***	***	***	***	***	***
Divorced	*		*		***	**	***	**	**	*	**	*

Overall, the results showed that those who received higher TBS performance scores also received higher performance evaluations in the operating forces, holding all else constant. Among the various measures of performance at TBS, the metric that

provided the largest positive impact on future performance was the Leadership ranking in model #1 with a coefficient of 0.045. This means a one percentage point increase in Leadership ranking at TBS increases the fitness report relative value by 0.045 points. Although Academics scores were also significant, the magnitude was very small (0.0075).

Other notable results included the effect of finishing in the top tier of a TBS class. That model predicted that average fitness report scores were 1.03 to 1.22 points higher for those who finished in the top tier than for officers who finished in the middle third. Additionally, an officer who was assigned an MOS preference that was not in his top three MOS preferences was predicted to have average fitness report scores that were 0.20 to 0.22 points lower than an officer who was assigned a top three MOS preference. Prior enlisted Marine Corps service predicted fitness report scores of 0.54 to 0.89 points higher than those who did not have prior enlisted service. The results also found that female officers had fitness report scores that were 1.3 to 0.84 points higher than male officers.

Lastly, the variable "Black" had a coefficient of -0.67 in the unrestricted model and a coefficient of -0.79 in the restricted model. These negative values were statistically significant and were interpreted as all else being equal, black officers had average fitness report scores 0.67 to 0.79 points lower than white counterparts. Wiler and Hurndon did not measure Hispanics directly but captured "otherrace," for those that were neither black nor white. This variable returned negative values in all but two of the models but it was not statistically significant in either of the models.

E.   RETENTION AND PERFORMANCE FACTORS

Ergun (2003) sought to estimate the effect of U.S. Marine Corps officer accession programs on career progression and performance. TBS performance, retention to ten years commissioned service (YCS), promotion success to the O4 and O5 pay grades and fitness report scores were all used as measures of performance and estimated as a function of an officer's accession source in multivariate models. The goal was to determine if there were measureable and significant differences in these performance

measures among Marine Corps officers from various accession programs, holding constant other potential determinants of performance.

Ergun used three different data sets in his analysis. The first file was the Marine Corps Commissioned Officer Accession Career (MCCOAC) data file provided by the Center for Naval Analysis (CNA). This file contained over 28,000 observations on cohorts who entered between 1980 and 1999. The second and third files both contained fitness report data. The need for two separate files was due to the change in the Marine Corps fitness report evaluation process in 1998. These files contained over 48,000 observations on officers in pay grades of O1 through O8.

Ergun used five different performance indicators in his models: (1) TBS performance, (2) retention to ten years of commissioned service, (3) promotion to O4, (4) promotion to O5 and (5) fitness report performance. In order to account for the change in the fitness reporting systems, Ergun created a performance index based on the fitness report marks observed across the two different fitness reporting systems. The two different fitness reporting performance indexes were analyzed separately for officers in the O2 through O5 pay grades.

Each of the various models that analyzed performance outcomes utilized the same combination of independent variables. These independent variables included marital status, commissioning age, gender, ethnicity group, commissioning options, prior enlisted service, GCT scores and commissioning source. A multivariate OLS model was used to measure TBS performance as a function of TBS Overall class rank, TBS Academic class rank, TBS Military Skills and TBS Leadership Class Rank. The 10-years retention model was estimated with a non-linear logit function. The O4 and O5 promotion models and the performance index models utilized a probit model. However, in the promotion models, author also estimated bivariate probit models to control for possible sample selection bias in the estimated coefficients of the accession program variable.

The results in Table 11 show that in all models some commissioning variables are highly significant. In addition to the varying statistical significance, the signs of some of the commissioning program variables change from one model to another. Therefore,

conclusions should be limited to general statements within each of the seven performance models. However, it should be noted that sample sizes differ depending on the career stage being evaluated. The Performance Index (PI) results are shown in columns 2, 4, and 6 of Table 11. The cells with two different values are to report both old and new fitness report results. The top values are the old report estimates and the bottom is for the new report estimates.

Table 11.   Model Results by Commissioning Source (after Ergun, 2003)

	TBS overall class rank (% Rank)	O-2 PI (%Perc.Points)	Retention to 10-year (%Perc.Points)	O-3 PI (%Perc.Points)	O-4 Prom. (%Perc.Points)	O-4 PI (%Perc.Points)	O-5 PI (%Perc.Points)
USNA (base case)							
NROTC	2.7***	-0.22*** 0.95***	N.S.	-0.47*** N.S.	7.5***	-0.12* N.S.	9.4**
PLC	-1.0*	-0.52*** -1.03**	-3.9**	-0.77*** -2.71***	10.0***	-0.12* -1.61***	6.3**
OCC	-4.9***	-0.46** N.S.	-10.5***	-0.85*** -1.33***	13.9***	N.S. - 1.23**	N.S.
MECEP	16.5***	0.35** 2.94***	15.0***	-1.28*** 1.54***	N.S.	N.S. N.S.	21.1***
ECP	4.1***	-0.25* 1.7**	N.S.	-1.19*** N.S.	9.1***	-0.32** -2.84***	25.0***
MCP	13.7***	N.S. 5.72***	N.A.	N.A.	N.A.	N.A.	N.A.
Prior Enlisted	3.3***	0.21*** 0.66*	6.7***	-0.528*** 1.50***	N.S.	N.S. N.S.	-27.5***

* Significant at the 0.10 level; ** Significant at the 0.05 level; *** Significant at the 0.01 level
Perc.Points = Percentage Points; N.S. = Not Significant

In all cases the effect of commissioning source was compared to USNA graduates. Graduates of PLC and OCC had lower performance for several of the outcomes, including TBS class rank, O2 and O3 fitness report performance, O4 fitness report and retention. MECEP graduates had better performance for all measures except O3 fitness reports. ECP graduates also performed well, while the effect of the MCP source was mostly insignificant.

As shown in Table 12, the effects of race and ethnicity were mostly statistically insignificant. One notable difference was that TBS overall class rank was lower for Hispanics, as well as for other minority groups, compared to whites.

Table 12.   Model Results by Selected Demographics (after Ergun, 2003)

	TBS overall class rank (% Rank)	O-2 PI (%Perc.Points)	Retention to 10-year (%Perc.Points)	O-3 PI (%Perc.Points)	O-4 Prom. (%Perc.Points)	O-4 PI (%Perc.Points)	O-5 PI (%Perc.Points)
White (base case)							
African American	-19.65***	-0.80*** -1.40***	3.29*	-0.28** -1.01**	N.S.	N.S. -1.05*	N.S.
Hispanic	-10.61***	N.S. N.S.	N.S.	N.S. N.S.	N.S.	N.S. N.S.	N.S.
Other Race	-7.34***	-0.22** N.S.	N.S.	N.S. N.S.	N.S.	N.S. N.S.	N.S.
Female	-8.98***	0.37*** 1.39***	3.96**	N.S. 1.98***	5.92**	N.S. 2.05*	N.S.

* Significant at the 0.10 level; ** Significant at the 0.05 level; *** Significant at the 0.01 level

Perc.Points = Percentage Points; N.S. = Not Significant

F.   LITERATURE REVIEW SUMMARY

The four studies chosen for this literature review represented a sample of the academic research available on military performance and success factors. The selection criteria for these studies were primarily based on the recent publication dates, connection to the naval services, and relationship to the major milestones of an officer's career (college, commissioning source, TBS, and fitness report performance). Additionally, each study utilized econometric statistical analysis that provided the early foundation for the selection of relevant variables and potential models for this thesis.

Each study in this literature review was published during the 1999 through 2014 timeframe that this study analyzed. This ensured that there was relevancy in the information derived from the literature review with that used in this study. Additionally, the currency of the literature review ensured consistency and commonality in the policies that were in place during this study with those of the literature review - unlike what Ergun (2003) witnessed in his study with a major change in fitness report policy. Each study also focused on populations of officers within the Navy or Marine Corps. This commonality within the Department of the Navy also ensured consistency in policies.

IV. DATA AND PRELIMINARY ANALYSIS

A. INTRODUCTION

This chapter describes in detail the rich data that was collected and used in the analysis. The full data set contains 7,880 individuals who represent the population of Marine Corps officers that commissioned in calendar years 1999 to 2004. Each individual was followed every year until the end of calendar year 2014, or until separation. The objective was to gather at least 10 years of data on each officer entry cohort in order to evaluate the individual outcomes at six and 10 years of active service since commissioning. The six-year mark encompasses the initial minimum service requirements (MSR) for all of the commissioning programs and allows individuals to choose to separate or retain on active duty. The 10-year mark represents the point at which each officer still on active duty is eligible for consideration for promotion to O4.

The data gathered is a mix of pooled and cross-sectional data. The variables generated from the pooled data sources were gathered based on the last recorded observation in the database (either at separation or at the end of 2014). The variables from the cross-sectional data capture values as annual "snapshots" over the time horizon covered by the data set. Due to this mixture of data types, variable usage is limited in some models.

B. THE DATA SOURCES

The data collected and used for this study was acquired from three sources:

1. Total Force Data Warehouse (TFDW) located within the Manpower Information Technology Branch under Manpower and Reserve Affairs (M&RA),
2. Manpower Management Records and Performance Evaluation Section (MMRP-30), augmented the TFDW data set with fitness report data, and
3. Center for Naval Analysis (CNA) with historical data from Marine Corps Recruiting Command (MCRC) on college sources and from TBS Basic Officer Course (BOC) test scores.

1.   The TFDW Data

The TFDW data was the source for the majority of the independent variables, providing 70 of the variables used in the analysis. This data set included commissioning source, awards, fitness test scores, weapons qualifications, separation data, administrative data and demographic data.

2.   The MMRP-30 Data

The MMRP data set provided six variables. This data set contains fitness report information from each officer's fitness report generated throughout their career. The files provide individual report values and summary averages by year. The summary averages are measured at year 6, 10, separation, or the last recorded value is used in this study. These variables include "at-processing" and "cumulative" averages for the reporting senior (RS) average relative value and the reviewing officer (RO) relative value. "At-processing" provides a scores value in comparison to all the other previously written reports on officers of the same grade by the RS or RO. The "cumulative" scores include any other reports written afterward and measures if an individual's score holds their value over time.

3.   The CNA Data

The CNA data set provides 16 variables. CNA maintains a database on TBS graduate's performance metrics from the BOC. Additionally, CNA collects data from MCRC on college attendance and college performance. This data includes the name of each college attended, college GPA, SAT and ACT scores.

4.   The Organization of the Data Set

The organization of the data is intended to represent the events that occur prior to and throughout an individual's career that affect retention and promotion decisions. Promotion factors are determined in part by a promotion board that receives guidance provided from the Secretary of the Navy and the Commandant of the Marine Corps. The promotion precepts are found on the Marine Corps' intranet website at (https://www.manpower.usmc.mil/portal/page/portal/M_RA_HOME/MM/F_PR/)   and states the members of the board shall:

Consider, without prejudice or partiality, the record of every eligible officer. The officers selected will be those officers whom a majority of the members of the board consider best qualified for promotion. In addition to the standard of best qualified, the officers recommended for promotion by the board must be fully qualified; that is, each officer's qualifications and performance of duty must clearly demonstrate that the officer would be capable of performing the duties normally associated with the next higher grade.

The variables obtained for this study are those that reflect an individual's overall abilities, qualifications, experience and performance that are used both by individuals making retention decisions (supply side) as well as by promotion boards (demand side). The full set of variables is organized in a chronological approach that includes four main categories:

- 1. Pre-entry: Demographic, pre-entry education and accession source,
- 2. TBS: TBS test scores, TBS ranking, TBS tier assignment and MOS preference,
- 3. Post-TBS: MOS category, basic military qualifications, awards, deployments, education, administrative and fitness report scores, and
- 4. Dependent Variables: Promotion, retention, and fitness report performance.

5.   Pre-entry Data

a.   *Demographic Information*

Table 13 provides a description and value for each demographic variable in the data set.

Table 13.   Demographics Variable Descriptions and Values

Name	Variable Description	Value
Female	Female Gender	= 1 if Yes, 0 No
AGEatCOMM	Age when commissioned	19.8 - 37.04
Naturalized	Naturalized U.S. Citizen	= 1 if Yes, 0 No
Hispanic	Cuban, Latin American, Mexican, Puerto Rican, Other Hispanic	= 1 if Yes, 0 No
Single	Last recorded marital status	= 1 if Yes, 0 No
Dependents	Last recorded number of dependents	0 - 8
*_6	Last recorded status at year 6	
*_10	Last recorded status at year 10	

The demographic variables capturing gender, age at commission and ethnicity are not updated (gender and end ethnicity do not change over time). The variables measuring number of dependents and marital status, *Dependents* and *Single*, are provided as the last recorded value as of the separation year or the end of 2014. Any other demographic variable with the tag marker of *_6 or *_10 indicate that a variable is recorded at that respective mark in time since commissioning. Citizenship data indicates the entire population has U.S. citizenship. However, the data is able to differentiate between those who were born a U.S. citizen versus those who were naturalized at some point in their life.

Table 14 shows the summary statistics for the demographic variables. The maximum number of observations is 7,880, but missing values reduce the number of observations for some variables Females are the minority gender among the sample. Single officer make up slightly more than half the sample and the mean number of dependents is just over 1.0. The average age at entry is over 24 and 2.1 percent are naturalized citizens.

Table 14.   Demographic Summary Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Demographics					
Female	7863	0.0892	0.2850	0	1
Single	7863	0.5455	0.4980	0	1
Hispanic	7880	0.0651	0.2467	0	1
AllNonHispanic	7880	0.9349	0.2467	0	1
Dependents	6026	1.0302	1.1966	0	8
AGEatCOMM	7856	24.6311	2.7368	19.8001	37.0486
Naturalized	7880	0.0211	0.1436	0	1

The data relies on self-reported race and ethnicity and a high percentage of individuals declined to provide an ethnicity. TFDW was asked to recheck the values and to search alternate sources, but the search did not change the results. Statistical data on ethnicity from the Office of the Under Secretary of Defense for Personnel and Readiness (OUSDPR) was obtained from http://prhome.defense.gov/RFM/MPP/AP/POPREP.aspx and was used as a baseline to

compare ethnicity information for the Marine Corps in this study to official Defense Department data. The comparison is reported in Table 15. A year-by-year comparison of Marine Corps officers shows that annual differences in the reported number of Hispanic officers are small. Table 15 shows that the data derived from TFDW for this thesis is a representative data set with an average of 6.52 percent Hispanics in the FY 1999 – 2004 cohorts used in the study as compared with an average of 7.10 percent as reported by OUSDPR data, a difference of about one-half a percentage point.

Table 15.   Comparison of Hispanic Officer Representation Data
(after OUSDPR)

Marine Corps Officer Accessions					
TFDW			OUSDPR		
Year	Total	% Hispanic	Year	Total	% Hispanic
1999	1333	6.75%	1999	1446	8.16%
2000	1403	7.06%	2000	1477	6.33%
2001	1366	6.95%	2001	1411	7.37%
2002	1317	6.23%	2002	2042	7.35%
2003	1149	5.83%	2003	1323	5.97%
2004	1298	6.32%	2004	1446	7.43%
Average		6.52%	Average		7.10%

b.   Pre-entry Education Information

Table 16 provides descriptions and values for each pre-entry education variable. These variables include the information on individual SAT and ACT scores obtained from CNA. The data was provided as two separate values as SAT and ACT are based on different grading scales. Appendix B contains the conversion chart from www.CollegeBoard.com that was used to convert the ACT scores into SAT scores. The final variable (*SATACTscore*) is a combination of the SAT provided data and the conversion of ACT to SAT equivalent scores.

CNA also provided the names of the colleges attended by each individual. This information was cross-referenced with selectivity data from Barron's *Profiles of American Colleges* to measure the selectivity of the colleges attended by the officers in

this study. Barron's selectivity rankings are available at http://www.barronspac.com for a small fee and provide a nine-value scale from "Most Competitive" to "Non-Competitive." If a school name was not identified as one from Barron's ranking, a new category was generated as "Not Listed." From those that were identified, the top five of nine competitive categories were grouped into one variable named *TopColl*. The methodology behind each of Barron's selectivity ranking is copyright protected and not available for scrutinizing. However, it is known that each category in Barron's scale is based in part on such factors as a school's acceptance rate and the average SAT score for those admitted.

Table 16.   Pre-entry Educational Variable Descriptions and Values

Name	Variable Description	Value
GCT	General Classification Test Score	67 - 156
SATACTscore	SAT and ACT Score	690 - 1600
coll_GPA	College GPA	1 - 4.0
TopColl	Attended a College classified as: Most, Highly+, Highly, Very Competitive+ or Very Competitive	= 1 if yes, 0 No
PriCollege	Attended a Private College	= 1 if yes, 0 No
Academy	Commissioned through Military Academy	= 1 if yes, 0 No
MECEP	Commissioned through MECEP	= 1 if yes, 0 No
NROTC	Commissioned through NROTC	= 1 if yes, 0 No
OCC	Commissioned through OCC	= 1 if yes, 0 No
MCP	Commissioned through MCP	= 1 if yes, 0 No
PLC	Commissioned through PLC	= 1 if yes, 0 No
Masters_0	Master's Degree prior to entry	= 1 if yes, 0 No
Doctorate_0	Doctorate prior to entry	= 1 if yes, 0 No
BachSTEM	STEM Bachelor's Degree	= 1 if yes, 0 No

TFDW provided data that lists college degree type and curriculum. Since all officers had a bachelor's degree at entry, this variable was not included in the analysis in Chapter V. Graduate degree completion dates were also included and tagged with *_0 to indicate the degree was attained prior to entry. All graduate degrees earned after entry are included in the post-TBS category and have appropriate tags to identify when they were earned relative to the entry date, as detailed in the sub-section below.

Appendix C lists the majors that were categorized as a Science, Technology, Engineering or Mathematics (STEM) degrees. While majors were available for graduate degrees, the variable *BacSTEM* only considers the undergraduate curriculums.

Table 17 shows the summary statistics for the pre-entry variables. The mean GCT score in the sample is slightly less than 125. The mean SAT or equivalent score is 1198. The mean college GPA is 2.93 and a majority of the students attended a top selectivity college. Less than one third attended a private university or earned their bachelor's degree in a STEM major. The OCC program accessed the most officers and less than two percent had a graduate degree prior to entry. SAT or ACT scores were available on only about half of all officers.

Table 17.   Pre-entry Educational Variable Summary Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Pre-Entry Education					
GCT	7815	124.9269	9.3614	67	156
SATACTscore	3671	1198	135.0824	690	1600
coll_GPA	5661	2.9365	0.4968	1.09	4
TopColl	7880	0.5463	0.4979	0	1
PriCollege	7158	0.2948	0.4560	0	1
Academy	7880	0.1117	0.3150	0	1
ECP	7880	0.0190	0.1367	0	1
MECEP	7880	0.1510	0.3581	0	1
NROTC	7880	0.1407	0.3478	0	1
OCC	7880	0.3807	0.4856	0	1
MCP	7880	0.0802	0.2716	0	1
PLC	7880	0.1166	0.3210	0	1
BacSTEM	7823	0.2341	0.4234	0	1
Masters_0	7880	0.0123	0.1103	0	1
Doctorate_0	7880	0.0024	0.0490	0	1

6.   TBS Performance Variables

Table 18 shows the variable descriptions and values for the TBS data. The TBS data provided by CNA contains variables that include overall GPA scores and scores for

the three individual categories (academics, leadership, and military skills) at TBS. TBS ranking and tier placement based on the assigned ranking are also included. Also included in the data set are the first three MOS preferences listed by each individual. These preferences were compared to the MOS assignments and used to generate four variables that reflect whether an individual received his first, second, or third preference. Officers assigned to flight training or as lawyers are done so prior to attending TBS. Therefore, the 7599 MOS and 4402 MOS were not considered in the MOS preference variables, which reduced the number of observations for these specific variables.

Table 18.   TBS Variable Descriptions and Values

Name	Variable Description	Value
tbs_academic_gpa	TBS Academic GPA	74.09 - 98.98
tbs_leadership_gpa	TBS Leadership GPA	75 - 98
tbs_militaryskill_gpa	TBS Military Skills GPA	74.73 - 98.48
tbs_overall_gpa	TBS Overall GPA	76 - 96.95
tbs_overall_rank	TBS Overall Rank	1 - 247
TBS_bottom	Bottom Tier Ranking	= 1 if yes, 0 No
TBS_middle	Middle Tier Ranking	= 1 if yes, 0 No
TBS_top	Top Tier Ranking	= 1 if yes, 0 No
TBSMOS_1st	1st MOS preference = MOS assigned	= 1 if yes, 0 No
TBSMOS_2nd	2nd MOS preference = MOS assigned	= 1 if yes, 0 No
TBSMOS_3rd	3rd MOS preference = MOS assigned	= 1 if yes, 0 No
TBSMOS_Other	MOS assigned ≠ Top 3 preferences	= 1 if yes, 0 No

Table 19 shows that there are missing observations for the individual academic, leadership and military skills TBS categories. The explanation for these missing observations apparently was due to errors in data entry. Since the TBS overall GPA encompasses scores on the three individual categories, the overall score is the primary metric for ranking officers. In this sample, the average TBS overall GPA is 87.3 points out of 100. The leadership grades were the lowest with an average of 85.1 and the academic grades were the highest at 89.0 points. The sample average for being assigned your first MOS preference was 44.8 percent, while 41 percent received neither one of their top three MOS preferences at the conclusion of the TBS.

Table 19.   TBS Variable Summary Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
TBS					
tbs_academic_gpa	6419	89.0343	4.2193	74.0966	98.9795
tbs_leadership_gpa	6419	85.1514	5.2364	75	98
tbs_military_skills_gpa	6416	88.2466	3.8004	74.7324	98.4848
tbs_overall_gpa	7727	87.3282	3.5530	76	96.9479
tbs_overall_rank	7727	110.9718	64.4044	1	247
TBS_bottom	7727	0.3409	0.4740	0	1
TBS_middle	7727	0.3332	0.4714	0	1
TBS_top	7727	0.3259	0.4687	0	1
TBSMOS_1st	5274	0.4480	0.4973	0	1
TBSMOS_2nd	5244	0.1112	0.3144	0	1
TBSMOS_3rd	5171	0.0737	0.2613	0	1
TBSMOS_Other	4569	0.4104	0.4920	0	1

7.   Post-TBS Category

a.   *MOS Categories*

MOS assignments occur following the completion of TBS but might not capture MOS in which an individual works later in their careers. Therefore, the MOSs listed in the last recorded fitness report are utilized to categorize an individual's MOS categories. Table 20 shows the 45 individual MOSs and the six categories to which each individual MOS is assigned.

Table 20.   Post-TBS MOS Descriptions and Values

Name	Variable Description	Value
combat_arms_mos	0302 0802 1802 1803	= 1 if yes, 0 No
avgrd_mos	7240 7208 7220 7210 6002 6602	= 1 if yes, 0 No
css_mos	0206 0402 4302 5803 0207 3002 0202 0203 0602 1302 0180 0204 3404	= 1 if yes, 0 No
law_mos	4402	= 1 if yes, 0 No
air_mos	7509 7525 7523 7532 7507 7521 7543 7556 7557 7558 7560 7561 7562 7563 7564 7565 7566 7567 7568 7588 7599	= 1 if yes, 0 No
mos_other	All Military Occupational Specialties that do not fall in the previous categories	= 1 if yes, 0 No

Table 21 shows the summary statistics for the MOSs. The MOS categories separate ground related job functions from those in the aviation field. Combat arms MOS are represented by infantry, artillery, and tank and amphibious vehicle officers. Aviation ground officers and Aviation officers both work in the aviation community but are differentiated by those who manage or maintain and those who operate aircraft in flight. The combat service support field represents a wide-encompassing field of work that mainly performs a supporting role to the combat arms and aviation fields.

Lawyers represented the smallest group with only 3.6 percent of the sample. Aviation ground officer made up 6.6 percent and combat arms made up 21.5 percent of this sample. The two largest MOS categories are CSS and aviation with 38.9 percent and 25.3 percent, respectively.

Table 21.   Post-TBS MOS Summary Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Post-TBS (MOS Categories)					
combat_arms_mos	7766	0.2158	0.4114	0	1
avgrd_mos	7766	0.0661	0.2484	0	1
css_mos	7766	0.3891	0.4876	0	1
law_mos	7766	0.0364	0.1874	0	1
air_mos	7766	0.2534	0.4350	0	1
mos_other	7766	0.0391	0.1940	0	1

b.   *Weapons Qualifications Data*

Rifle and pistol qualifications were provided with corresponding completion dates. Completion dates are used to generate the weapons qualifications variables at the six and 10-year mark. While the rifle and pistol qualifications are intended to be conducted annually, there are often gaps in annual qualifying. Therefore, the last recorded value up to the six and 10-year mark is used to populate these variables.

Table 22 shows the four different qualifications that are used to measure performance for both pistol and rifle qualifications. A value of 1 is used to indicate that someone does not have qualification on record while a 4 is used to indicate the highest qualification of 'Expert.'

Table 22.   Post-TBS Weapon Qualifications Variable Descriptions

Name	Variable Description	Value
HiRifQualYear6	Highest Rifle Qual at 6 Yrs of Active Service: 1 = Unqualified, 2 = Marksman, 3 = Sharpshooter, 4 = Expert	1 - 4
HiRifQualYear10	Highest Rifle Qual at 10 Yrs of Active Service: 1 = Unqualified, 2 = Marksman, 3 = Sharpshooter, 4 = Expert	1 - 4
HiPisQualYear6	Highest Pistol Qual at 6 Yrs of Active Service: 1 = Unqualified, 2 = Marksman, 3 = Sharpshooter, 4 = Expert	1 - 4
HiPisQualYear10	Highest Pistol Qual at 10 Yrs of Active Service: 1 = Unqualified, 2 = Marksman, 3 = Sharpshooter, 4 = Expert	1 - 4

Table 23 shows descriptive statistics for the weapons qualification variables. In year 6, the average highest rifle qualification attained was between an "expert" and a "sharpshooter." Similar results were obtained for the pistol qualification, but more officers attained "expert" on the rifle than they did on the pistol. By year 10, each of the average highest qualification increased with more individuals attaining "expert." This data indicates that as years in the Marine Corps increases, proficiency in weapons handling or use increases.

Table 23.   Post-TBS Weapons Qualification Variable Summary Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Post-TBS (Weapons Qualification)					
HiRifQualYear6	7823	3.6307	0.6645	1	4
HiRifQualYear10	7826	3.7128	0.5974	2	4
HiPisQualYear6	7812	3.4598	0.6654	1	4
HiPisQualYear10	7817	3.5457	0.6310	1	4

c.   Fitness Score Data

Table 24 shows the PFT score variable descriptions and values. The PFT scale is based on a 300 point scale. PFT completion dates are also provided and used to generate the average scores at the six and 10-year mark. *AvgPFTScore* is generated to encompass the average score for all PFT scores in the database. In the original data set, some values are missing or incomplete because of medical reasons or due to a deployment during the

reporting period. Also included in the original data set are scores for the CFT. Due to the introduction of the CFT coming several years after the entry dates for this study's population, this data is not included due to a majority of the observations not having values at the six year mark.

Table 24.   Post-TBS Fitness Score Variable Descriptions and Definitions

Name	Variable Description	Value
AvgPFTScore	Average Career PFT Score	146.77 - 300
PFT_6	Average PFT Score after 6 Yrs of Active Service	172.8 - 300
PFT_10	Average PFT Score after 10 Yrs of Active Service	172.8 - 300

Table 25 shows descriptive statistics for physical fitness scores. The average PFT score in the sample at year 6 is 264. With a standard deviation of 22 points, those within one standard deviation lower than the average are still in range for a first class score of 225. By year 10, the average scores drop by less than one point which indicates that physical performance does not change much over the four year period. 7.2 percent of the sample population failed their PFT at least once in their career.

Table 25.   Post-TBS Fitness Score Summary Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Post-TBS (Fitness Scores)					
AvgPFTScore	7805	263.4688	22.20365	146.7778	300
PFT_6	7805	264.2691	22.02737	145.3333	300
PFT_10	7805	263.8002	22.13547	146.7778	300
PFTFail	7880	0.0726	0.3270	0	5

d.   *Marine Corps Martial Arts Program Information*

Table 26 shows the variables based on the Marine Corps Martial Arts Program (MCMAP). MCMAP qualifications are based on a tiered belt system that establishes the Tan Belt as the initial training level and Black Belt as the most advanced level. Also included in the tier system are several levels of instructor qualifications. These values

48

were grouped together with their corresponding basic belt. For instance, a Brown Belt instructor and a regular Brown Belt are categorized together as the same level of training.

Table 26.   Post-TBS MCMAP Variable Descriptions and Definitions

Name	Variable Description	Definition
TanBelt_6 TanBelt_10	Tan Belt attained prior to year 6 Tan Belt attained prior to year 10	= 1 if yes, 0 No
GrayBelt_6 GrayBelt_10	Gray Belt attained prior to year 6 Gray Belt attained prior to year 10	= 1 if yes, 0 No
GreenBelt_6 GreenBelt_10	Green Belt attained prior to year 6 Green Belt attained prior to year 10	= 1 if yes, 0 No
BrownBelt_6 BrownBelt_10	Brown Belt attained prior to year 6 Brown Belt attained prior to year 10	= 1 if yes, 0 No
BlackBelt_6 BlackBelt_10	Black Belt attained prior to year 6 Black Belt attained prior to year 10	= 1 if yes, 0 No

In 2002, Marine Corps Order 1500.54 was published and officially created training requirements for all Marines to complete various levels of training. With the implementation of this program during the entry period for this study's population, the total number of observations was limited. Despite increasing observations at the 10-year mark, there are still large numbers of missing values among these variables.

Table 27 shows the summary statistics for MCMAP qualification in the sample. 96 percent of the sample attained their minimum MCMAP training by receiving a Tan belt in their first six years of service as an officer. 2.7 percent received the highest level of Black belt. By year 10, 9.4 percent achieved the highest level of Black belt. At year 6, 56.8 percent had a Gray belt and this increased to 74.9 percent by year 10. It is noteworthy that information on MCMAP qualification was available on only about three fourths of all officers.

Table 27.   Post-TBS MCMAP Variable Summary Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Post-TBS (MCMAP Level)					
TanBelt_6	5745	0.9603	0.1952	0	1
GrayBelt_6	5745	0.5680	0.4954	0	1
GreenBelt_6	5745	0.2597	0.4385	0	1
BrownBelt_6	5745	0.0715	0.2577	0	1
BlackBelt_6	5745	0.0272	0.1625	0	1
TanBelt_10	5958	0.9562	0.2047	0	1
GrayBelt_10	5958	0.7496	0.4333	0	1
GreenBelt_10	5958	0.4490	0.4974	0	1
BrownBelt_10	5958	0.1757	0.3806	0	1
BlackBelt_10	5958	0.0947	0.2928	0	1

e.   *Deployment Data*

Deployment data contained in the data set is listed in Table 28. These variables are based on a pooled database, which provided values without regard to a specific date. The deployments are separated by combat deployments and non-combat deployments. Combat deployments are entered into the Marine Corps' database based on entry and exit from a designated combat zone. As noted in Garza (2014), administrative errors are possible and differentiation may be difficult to decipher traditional seven-month deployments from all others. To provide further clarity, the total number of days deployed for both combat and non-combat deployments are provided.

Table 28.   Post-TBS Deployment Variable Descriptions and Definitions

Name	Variable Description	Definition
CombatDeps	Total Number of Combat Deployments	0 - 18
CombatDepDays	Total Accumulated Days on Combat Deployments	0 - 2344
NonCombatDep	Total Number of Non-Combat Deployments	0 - 7
NonCombatDepDays	Total Days on Non-Combat Deployment	0 - 2803

The descriptive statistics in Table 29 show that the average number of combat deployments is 2.48. The average number of accumulated days deployed in combat is 442 days. The average number of non-combat deployments is less than one with an average of 51 days. These averages include deployments for anyone who was previously enlisted and is not in reference to a particular time period relative commissioning date.

Table 29.   Post-TBS Deployment Variable Summary Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Post-TBS (Deployment)					
CombatDeps	7125	2.4824	1.4415	0	18
CombatDepDays	7125	442.2032	238.6031	0	2344
NonCombatDep	7125	0.6518	0.8089	0	7
NonCombatDepDays	7125	51.1714	180.1962	0	2803

f.   *Awards Data*

The awards data set included all awards received with dates. Each award was provided with a description of the award and the date the award was entered into the database. In order to capture awards that were received during the observation period, all awards that were dated prior to the commissioning date were dropped. Additionally, awards were dropped if their corresponding date was greater than ten years from commissioning. The resulting variables represent the total number of awards from commissioning to year 6 and to year 10.

Two separate variables were generated from the awards database. The first is the total number of awards listed for each individual. The other is the total number of Sea Service Deployment Ribbons. *SeaServRib* is generated to act as a qualifier for the deployment variables. The Sea Service Deployment ribbon's criterion is based on a 90 to 356-day deployment range for individuals deployed with units away from its homeport and is described in detail at the navy website (https://awards.navy.mil/awards /webapp01.nsf/(vwAwardsDisp)/AW-10052085N4N9?OpenDocument). Table 30 shows the awards description and values used in sample.

Table 30.   Post-TBS Award Variable Descriptions and Values

Name	Variable Description	Value
Awards_6	Total awards received between commission and year 6	1 - 33
Awards_10	Total awards received between commission and year 10	1 - 51
SeaServRib_6	Total Sea Service Dep. Ribbons from commission to year 6	1 - 8
SeaServRib_10	Total Sea Service Dep. Ribbons from commission to year 10	1 - 11

The summary statistics in Table 31 indicate that the average number of sea service deployment ribbons earned during the first six years of commissioned service is 1.9. By year 10 the average increases to 2.7. For total number of awards, the sample average is 9.1 at year 6 and 13.5 at year 10.

Table 31.   Post-TBS Award Variable Summary Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Post-TBS (Awards)					
SeaServRib_6	6888	1.9370	0.8966	1	8
SeaServRib_10	7299	2.7004	1.2878	1	11
Awards_6	7763	9.1	4.1	1	33
Awards_10	7763	13.5	5.9	1	51

g.   *Resident PME Information*

Expeditionary Warfare School (EWS) provides Marine captains with career-level professional military education. This course is provided to all officers either through a distance education program or a 40-week resident program. Attendees of the resident program receive a diverse exposure to several professional, Marine Corps related topics in a traditional college-style environment. During the course, the attendee only duty requirement is to attend the courses, seminars and social functions. These events occur four to five days a week during an eight-hour period of the day. The environment through the extent of the course is designed to provide conditions more suitable for traditional education in comparison to the schedule most officers experience in their previous assignments. Table 32 shows the variable description and definitions used for this sample.

Table 32.   Post-TBS Resident PME Variable Descriptions and Definitions

Name	Variable Description	Definition
ResEWS_6 ResEWS_10	Graduated from the resident EWS school prior to year 6 Graduated from the resident EWS school prior to year 10	= 1 if yes, 0 No

Table 33 shows that in the sample, less thanone percent of the population attended resident EWS within their first six years from commissioning. By year 10, 13 percent had attended the resident EWS course. Resident EWS attendants are board-selected and become eligible to attend after completing their first duty assignment in their primary MOS. Eligibility continues for subsequent years up to selection to O4 for all captains not committed to other billet assignments. Completion of the non-resident course does not factor into the acceptance of the resident EWS course.

Table 33.   Post-TBS Resident PME Summary Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Post-TBS (Resident PME School)					
ResEWS_6	7880	0.0047	0.0684	0	1
ResEWS_10	7880	0.1329	0.3395	0	1

h.   *Administrative Information*

The variables in this category are administrative in nature and include events that occurred after completing TBS. The *InjWounded* variable represents those who were recorded as having been injured or wounded during the period covered. The conditions for these injuries and wounds were provided in the data as occurring either in a combat environment or non-combat environment. Both conditions are included in the *InjWounded* variable. *Passed* represents those who have failed selection for promotion. Initial failure to select for promotion does not automatically require separation. For captains and lesser ranks, subsequent failure for promotion requires automatic separation. For the period covered in this study, officers are eligible for promotion to three separate ranks. Therefore, failure to be selected for promotion may not occur two consecutive

times but may occur up to three total times. Table 34 shows the variable descriptions and definitions used for the sample.

Table 34.   Post-TBS Administrative Variable Description and Definition

Name	Variable Description	Definition
InjWounded_6 InjWounded_10	Injured or wounded prior to year 6 Injured or wounded prior to year 10	= 1 if yes, 0 No
Passed_6 Passed_10	Passed for promotion prior to year 6 Passed for promotion prior to year 10	= 1 if yes, 0 No
Masters_6, Masters_10	Master's Degree after entry, prior to year 6 Master's Degree after entry, prior to year 10	= 1 if yes, 0 No
O3TIG O2TIG O1TIG	O3 Date of rank minus by date of rank for O2 (in months) O2 Date of rank minus by O1 date of rank (in months) O1 Date of rank minus by commissioning date (in months)	0 - 111.6333

The education files that are used in the pre-entry category that identify graduate education are again used in this category. Those that were identified as earning a graduate degree after entry into the Marine Corps are identified with the *_6 and *_10 tags to indicate the degree was recorded after entry but prior to the indicated year from commission.

In Table 35 the summary statistics indicate that less than four percent of the sample was injured in their first 10 years. Less than one percent was passed for promotion. The *TIG* variables represent the time in grade between ranks. The values were calculated in months from the dates of rank provided in the database. The O3TIG has fewer observations than the other ranks primarily due to those that were not promoted to O4. Since they do not have a date of rank to O4, a calculation was not completed leaving a missing value. The average TIG as a captain for those in the sample is 70.9 months before being promoted to major. Less thanone percent in the sample had a doctorate at any point in their first 10 years, while 6.4 percent earned a master's degree before their 10th year.

Table 35. Post-TBS Administrative Summary Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Post-TBS (Administrative)					
InjWounded_6	7880	0.0353	0.2047	0	4
InjWounded_10	7880	0.0378	0.2187	0	4
Passed_6	7880	0.0079	0.1112	0	3
Passed_10	7880	0.0079	0.1112	0	3
Masters_6	7880	0.0459	0.2094	0	1
Doctorate_6	7880	0.0057	0.0754	0	1
Masters_10	7880	0.0643	0.2454	0	1
Doctorate_10	7880	0.0046	0.0674	0	1
O3TIG	4477	70.9024	13.8750	24.4333	111.6333
O2TIG	7163	29.9557	3.4318	8.7	79.8333
O1TIG	7379	24.0921	2.0730	0	54.8333

i. *Fitness Reports*

Table 36 describes the fitness report variables provided by MMRP-30. As described in Chapter II, fitness reports are written on individual by a reporting senior (RS) and a reviewing officer (RO). The RS and RO provide their evaluation of the Marine reported on conduct and actions during the reported period. Despite several quantitative entries such as PFT score included in the fitness report, only section D through H of the fitness report contribute to the final numeric score. These scores are compared relatively to the scores given by the same RS and RO to other individuals of the same pay grade. The scores relative values are recorded for each individual and are used in this study. The relative values are calculated based on two separate time frames. The first weighs a score's value relative other reports written at the time the report is processed. The other measure is taken relative to the cumulative scores which includes reports written after the "at-processing" report. The cumulative report provides assessment on how a report holds its value through time.

Table 36.   Post-TBS Fitness Report Variable Descriptions and Definitions

Name	Variable Description	Definition
AvgRV_Proc	"At Processing" Relative Value Average of Averages	80 - 100
AvgRV_Cum	"Cumulative" Relative Value Average of Averages	80 - 100
AvgRORV_Proc	Average RO Relative Value "At Processing"	-4 - 2.652778
AvgRORV_Cum	Average RO Relative Value "Cumulative"	-3.92 - 1.88
*_6	Averaged scores from commission to year 6	
*_10	Averaged scores from commission to year 10	

The relative value scores recorded at time of processing is indicated with *_Proc tag. The cumulative relative value scores are recorded with a *_Cum tag. Each are provided for both the RS and the RO's scores with the "RO" added to the variable name representing the RO's relative value score. Similar to the fitness report averages generated previously, fitness report scores are recorded at different years through an individual's career. The scores up to the six and 10-year mark were identified and the average value was taken for all the scores in that time frame. Additionally, the overall average for all reports on file is provided and is indicated by the variables that do not have a time tag. These values represent the last recorded relative values such as date of separation and do not specify a common date or period length for all observations.

The summary statistics in Table 37 shows the RS scores relative to an 80 to 100 point scale with 80 being the minimum and 100 the maximum. In the sample, by year 10 the average cumulative relative value from the RS is 90.18. The RO score is a based on a seven tier placement system. The recorded scores are each individual's placement is relative to the average placement of the other officers reported on. Negative values indicate that a score's relative value is below the relative average for all other reports written by the RO on officers of the same rank. By year 10, the average cumulative score from the RO is -0.05 points below the RO's average.

Table 37.   Post-TBS Fitness Report Variable Summary Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Post-TBS (Fitness Reports)					
AvgRV_Proc_6	7486	91.35678	4.698462	80	100
AvgRV_Cum_6	7624	89.89167	3.858841	80	100
AvgRORV_Proc_6	7706	0.0290787	0.5726798	-4	2.65278
AvgRORV_Cum_6	7706	-0.1000	0.5491	-3.9231	1.9731
AvgRV_Proc_10	6387	91.6010	4.0594	80	100
AvgRV_Cum_10	7715	90.1843	3.4128	80	100
AvgRORV_Proc_10	7743	0.0774	0.5398	-4.0000	2.6528
AvgRORV_Cum_10	7743	-0.0522	0.5215	-3.9231	1.8850

8.   Dependent (Outcome) Variables

a.   *Promotion Variables*

Promotion outcome variables were generated to indicate whether an individual was promoted to a specific rank. The original data set recorded each rank with an "E" tagged on the pay grade if the individual had prior enlisted service. These two separate identifiers (paygrade and "E" tag) were categorized together to indicate the entire group of individuals that attained the ranks of second lieutenant through major, as shown in Table 38. For example, variable O3O3E takes a value of 1 if the data indicated either O3 or O3E. Since each officer in the data set is commissioned as a second lieutenant, the O1 variable was removed. The *O4O5* binary variable takes a value of 1 if the officer is promoted to O4 or above, 0 otherwise. The 2003 and 2004 entry cohorts have attained promotion selection eligibility, but may not have been promoted by the end of 2014. The promotion file was augmented by a file that indicated promotion selection, and was merged with the promotion file. The end result is the *O4O5* variable, which includes those who have been selected for O4. Table 38 describes and defines the promotion dependent variables used in this sample

Table 38.   Dependent Variable Description and Definition

Name	Variable Description	Definition
O4O5*	Promotion of retained beyond 10 years	= 1 if Yes, 0 No
O4O5	Attained rank of O4 or higher	= 1 if Yes, 0 No
O3O3E	Attained rank of O3	= 1 if Yes, 0 No
O2O2E	Attained rank of O2	= 1 if Yes, 0 No

Promotion summary statistics include all observations in the population and are shown in Table 39. This includes those who may not have been eligible for promotion or who stayed in the Marine Corps to be reviewed for promotion. The results should be interpreted in reference to the entire sample of new accessions. For instance, among all officers who entered from 1999 through 2004, 56 percent were promoted to O4 or major (refer to variable O4O5). The O4O5* variable was generated to indicate promotion to O4 or above only for those officers who were retained at 10 years of service. Of the 4,274 observations who stayed for 10 years, 82 percent were selected or promoted to major. These officers were reviewed for promotion approximately in years 2009 through 2014These officers were reviewed for promotion approximately in years 2009 through 2014.

Table 39.   Dependent Variable Summary Statistics

Variable	Obs	Mean	Std. Dev.	Min	Max
Promotion					
O4O5*	4274	0.8205	0.3838	0	1
O4O5	7880	0.5683	0.4953	0	1
O3O3E	7880	0.9518	0.2143	0	1
O2O2E	7880	0.9782	0.1461	0	1

b.   *Retention Variables*

The retention variables are based on separation data and are shown in Table 40. This data includes separation dates, descriptions and conditions. A separation date is used to determine if an observation separated from active duty and, if so, when. Those with separation dates prior to the sixth year from commission were identified. The remaining observations were then considered still retained on active duty after six years from

58

commissioning. The same considerations were taken at the 10 year mark. For those that had no separation date, they were identified with the *Active2015* variable, which indicates that they are still of Active duty in 2015. Table 40 describes and defines the retention dependent variables used from the sample.

Table 40.   Dependent Variable Description and Definition

Name	Variable Description	Definition
Active2015	Still on Active Duty as of 31 December 2014	= 1 if Yes, 0 No
Active_6	Still on Active Duty at year 6	= 1 if Yes, 0 No
Active_10	Still on Active Duty at year 10	= 1 if Yes, 0 No

Similar to the promotion variables, the retention variables are in reference to the entire population of new accessions. Once again, the exception is with the *Active_10** variable that is only in reference to those who were retained beyond the six-year mark. As shown in Table 41, 74 percent of those stayed beyond six years of service stayed to 10 years of service. By comparison, only 54 percent of all those that entered from 1999 to 2004 stayed to 10 years.

Table 41.   Dependent Variable Summary Statistics--Retention

Variable	Obs	Mean	Std. Dev.	Min	Max
Retention					
Active_6	7807	0.7337	0.4421	0	1
Active_10*	5728	0.7462	0.4352	0	1
Active_10	7807	0.5475	0.4978	0	1
Active2015	7807	0.4117	0.4922	0	1

c.   *Other Variables*

Included among the demographic variables is the individual's home state. The distribution of new officers by home of record (HOR) state is included in Table 42. Also included in italicized font is the percent of Hispanics among this study's population that

originated from the corresponding state. Highlighted in yellow are the states with Hispanic population concentrations (see also Figure 1)).

Table 42.   Home of Record State for the Entire Population and For Hispanics

	Entrants (N=7528)	*Hispanic Entrants (n=503)*									
AK	0.28%	*0.00%*	MT	0.00%	*0.36%*	ID	0.42%	*0.20%*	RI	0.20%	*0.28%*
AL	1.01%	*0.40%*	NC	1.39%	*2.34%*	IL	3.25%	*2.98%*	SC	0.40%	*1.35%*
AR	0.34%	*0.00%*	ND	0.00%	*0.15%*	IN	1.57%	*0.20%*	SD	0.00%	*0.22%*
AZ	0.98%	*2.98%*	NE	0.40%	*0.70%*	KS	0.74%	*0.40%*	TN	0.99%	*1.35%*
CA	8.81%	*19.48%*	NH	0.20%	*0.52%*	KY	0.73%	*0.20%*	TX	21.67%	*7.36%*
CO	1.29%	*0.60%*	NJ	2.78%	*2.46%*	LA	1.30%	*0.20%*	UT	0.40%	*0.64%*
CT	1.18%	*0.60%*	NM	2.19%	*0.52%*	MA	2.16%	*1.19%*	VA	2.19%	*4.78%*
DC	0.22%	*0.00%*	NV	0.20%	*0.39%*	MD	2.38%	*1.19%*	VT	0.20%	*0.22%*
DE	0.19%	*0.00%*	NY	5.57%	*5.24%*	ME	0.56%	*0.00%*	WA	0.80%	*2.10%*
FL	4.77%	*8.75%*	OH	0.80%	*3.12%*	MI	2.75%	*0.60%*	WI	0.40%	*1.07%*
GA	2.14%	*0.80%*	OK	0.40%	*0.69%*	MN	1.23%	*0.60%*	WV	0.00%	*0.43%*
HI	0.23%	*0.00%*	OR	0.80%	*1.30%*	MO	1.55%	*0.60%*	WY	0.00%	*0.25%*
IA	0.71%	*0.20%*	PA	0.60%	*4.05%*	MS	0.36%	*0.00%*			

The population was selected based on the calendar year of commission date. Retention and promotion considerations are changed by neither calendar nor fiscal year entry dates. Calendar year was selected due to the common usage of this time frame by most people in and out of the military.

Table 43 indicates the commission years covered in this study and provides a summary for number of entrants per year. The year with the fewest entrants is 2003 with 1,149 entrants. The year with the largest number of entrants is 2000 with 1,402 entrants. The average cohort size among the six years in this sample is 1,310 entrants.

Table 43.   Commissioning Calendar Year

Variable	Obs	Mean	Std. Dev.	Min	Max
Calendar Year of Commissioning					
1999	7863	1331	16.93	0	1
2000	7863	1402	17.83	0	1
2001	7863	1366	17.37	0	1
2002	7863	1317	16.75	0	1
2003	7863	1149	14.61	0	1
2004	7863	1298	16.51	0	1

C.   PRELIMINARY ANALYSIS

1.   Descriptive Statistics

This study's primary and secondary research questions seek to identify retention, promotion and performance differences between Hispanics and non-Hispanics. Additionally, each research question seeks to identify factors that may cause any observed differences. In order to identify any statistically significant differences between the variables gathered in this study, a *t*-test of group means is conducted for selected variables.

The *t*-test is a common statistical method for testing a hypothesis about a single parameter in a population regression function (PRF) (Wooldridge 4th edition p 120). This study's PRF is described as retention, promotion, or performance as a function of the variables categorized earlier in this chapter. The *t*-test therefore identifies the differences in the average value of a single variable between Hispanics and non-Hispanics. Additionally, a critical value or *t*-stat is provided which allows for rejection criteria to be set for any differences in averages that are statistically the same as zero. The larger the absolute value of the *t*-stat is, the further away the differences in average are from zero on a *t*-distribution. The rejection criteria for this study's variables are provided at the 10, 5 and one percent levels. In other words, a *t*-stat value greater than the one percent threshold states the differences in values between 99 percent of randomly selected Hispanic and non-Hispanics variables are other than zero. A variable is considered

statistically significant at the 10 percent level if its *t*-stat is greater than 1.28. A variable is considered highly significant if its t-stat value is greater than 2.3 which signify the one percent level.

2. Statistical Differences between Hispanics and Non-Hispanics

Chapter I of this study provides primary and secondary questions regarding retention, promotion, and performance differences between Hispanic and non-Hispanic Marine Corps officers. To address these questions, *t*-tests are generated on several of the variable categories covered previously in this chapter. The *t*-tests show the difference in mean values between Hispanic and non-Hispanic Marine Corps officers in this study's population. Chapter V will address the questions regarding which factors explain any differences.

- Question 1 a): Are there any differences in retention and promotion rates between Hispanic and non-Hispanic Marine Corps officers?

Table 44 shows that the retention rate at year 6 for Hispanics is three percentage points (ppts) or (4 percent) higher than for non-Hispanics. In comparison to the population that stayed on active duty beyond six years, the difference in retention between Hispanic and non-Hispanic officers at the 10-year mark is also significant (at the five percent level) with an average difference of 4.6 ppts or 5.8 percent. Promotion rate differences between Hispanic and non-Hispanic Marine Corps officers from Table 44 are statistically insignificant for both promotion variables. This indicates that there is no measurable difference in promotion rates between the two groups.

Table 44.   T-test of Dependent Variables

Variable	N	Full	Hispanic	Non-Hispanic	t-stat	Sign. Level
Active2015	7807	0.4117	0.4495	0.4091	-1.786	**
Active_6	7807	0.7337	0.7624	0.7317	-1.5075	*
Active_10	7807	0.5475	0.6020	0.5437	-2.546	***
Active_10*	5728	0.7462	0.7896	0.7430	-2.0287	**
O4O5	7880	0.5683	0.5731	0.5679	-0.2282	-
O4O5*	5801	0.6983	0.6718	0.7003	1.1886	-

Significance Level: * = .10 (1.282), ** = .05 (1.646), *** = .01 (2.330)

- Question 2 a) Prior to commissioning, are there any differences in education and test scores between Hispanic and non-Hispanic Marine Corps officers?

The variables that best address education questions are *TopColl*, *PriColl*, and *BacSTEM*. As shown in Table 45, *TopColl* is the only variable that is significantly different between the two ethnic groups. The difference in means shows that attendance at highly selective colleges is 10 points, or 18 percent, less for Hispanics. Test score variables are *SATACTscore*, *coll_GPA*, and *GCT* and each of these variables are statistically significant. These variables show that Hispanics are underperforming when compared to non-Hispanics. The average SAT and ACT scores are 44 points lower, college GPA results are 2.6 percent lower and GCT scores are three percent lower among Hispanics in comparison to non-Hispanics.

Accession or commissioning source is not directly related to education quality but still provides an indirect link since the higher funded accession sources are associated more often with higher quality schools. Among the five accession sources that were compared, NROTC and MECEP provide the only statistically significant values at the one percent level. The results show that the difference between Hispanic and non-Hispanic participation in NROTC is 5.7 ppts indicating there less Hispanics than non-Hispanics in NROTC. The difference in MECEP participation among Hispanics is 11 ppts higher than non-Hispanics which equates to a 43 percent difference. The OCC program commissions nearly half of officer population and the difference between Hispanic and non-Hispanic participation in this program 9.7 percent less.

Table 45.   T-test of Pre-entry Variables

Variable	N	Full	Hispanic	Non-Hispanic	t-stat	Sign. Level
SATACTscore	3671	1198.0000	1156.3350	1200.3240	4.4254	***
coll_GPA	5661	2.9365	2.8652	2.9413	2.7957	***
TopColl	7880	0.5459	0.4524	0.5524	4.4119	***
PriCollege	7158	0.2947	0.3122	0.2935	-0.8486	-
BacSTEM	7823	0.2339	0.2148	0.2353	1.0554	-
Masters_0	7886	0.0123	0.0136	0.0122	-0.2751	-
Doctorate_0	7886	0.0024	0.0019	0.0024	0.2238	-
GCT	7819	124.9276	121.4414	125.1719	8.7583	***
Academy	7886	0.1116	0.1010	0.1123	0.7916	-
NROTC	7886	0.1410	0.0874	0.1448	3.6197	***
OCC	7886	0.3805	0.3456	0.3830	1.6882	**
PLC	7886	0.1165	0.1049	0.1174	0.8545	-
MECEP	7886	0.1510	0.2544	0.1438	-6.7933	***

Significance Level: * = .10 (1.282), ** = .05 (1.646), *** = .01 (2.330)

- Question 2 b) Does TBS performance differ between Hispanic and non-Hispanic Marine Corps officers?

Differences in each of the five TBS variables shown in Table 46 are statistically significant. Hispanics place an average of 22 points further away from the top performing position than non-Hispanics, a difference of 16.7 percent. The average overall GPA from TBS is 1.5 percent less for Hispanics than for non-Hispanic officers and each of the three evaluated areas of Leadership, Academics, and Military Skills produce differences of less than 1.4 ppts.

Table 46.   T-test of TBS Variables

Variable	N	Full	Hispanic	Non-Hispanic	t-stat	Sign. Level
tbs_overall_rank	7727	110.9718	131.5928	109.5421	-7.4369	***
tbs_overall_gpa	7727	87.3282	86.1439	87.4103	7.7443	***
tbs_leadership_gpa	6419	85.1514	83.9392	85.2365	4.9225	***
tbs_academic_gpa	6419	89.0343	87.6925	89.1285	6.7736	***
tbs_militaryskills_gpa	6416	88.2466	87.2522	88.3164	5.5669	***

Significance Level: * = .10 (1.282), ** = .05 (1.646), *** = .01 (2.330)

- Question 2c) Does the distribution of Marine Corps officers into different military occupational specialties (MOS) differ between Hispanic and non-Hispanic officers?

As shown in Table 47, the CSS and Aviation MOS categories have the greatest differences between the two demographic groups. Hispanic Marine Corps officers are more heavily represented in the CSS MOS category than non-Hispanic officers. The difference is 10.89 ppts, or 22 percent. In contrast, in the aviation MOS category Hispanics are underrepresented by 10.87 ppts, a difference of 41.7 percent.

Table 47.   T-test of MOS Assignment

Variable	N	Full	Hispanic	Non-Hispanic	t-stat	Sign. Level
combat_arms_mos	7766	0.2158	0.1976	0.2171	1.0242	-
css_mos	7766	0.3891	0.4910	0.3821	-4.8427	***
avgrd_mos	7766	0.0661	0.0818	0.0650	-1.4702	*
air_mos	7766	0.2534	0.1517	0.2604	5.4212	***
law_mos	7766	0.0364	0.0399	0.0362	-0.4296	-

Significance Level: * = .10 (1.282), ** = .05 (1.646), *** = .01 (2.330)

- Question 2d) Do the career experiences following TBS differ between Hispanic and non-Hispanic Marine Corps officers?

The events that each individual experiences during their career may differ vastly depending on various factors. The awards and deployment variables were chosen to best reflect the differences in career experience since they summarize what, where, and how someone did throughout their career. Among these variables shown in Table 48, only *Award_6* and *NonCom_DaysDep* were statistically significant differences between Hispanics and non-Hispanics. A 3.2 percent difference exists between Hispanic and non-Hispanic officers in the average number of awards received during the first six years after commissioning. Among the deployment data, the difference in the average number of days on a non-combat deployment is 20.6 percent indicating that Hispanic Marine Corps officers on average spend more days on non-combat deployment than non-Hispanics.

Table 48.   T-tests of Awards and Deployment Variables

Variable	N	Full	Hispanic	Non-Hispanic	t-stat	Sign. Level
Awards_6	7763	9.1383	9.4206	9.1187	-1.5957	*
Awards_10	7763	13.4567	13.7460	13.4366	-1.1424	-
SeaServRib_6	6888	1.9370	1.9521	1.9360	-0.3633	-
SeaServRiB_10	7299	2.70037	2.68017	2.701757	0.3511	-
NonCombatDepDays	7125	51.1714	63.4114	50.3325	-1.5012	*
ComDepDays	7125	442.203	445.645	441.9673	-0.3188	-

Significance Level: * = .10 (1.282), ** = .05 (1.646), *** = .01 (2.330)

- Question 2e) Does fitness report performance differ between Hispanic and non-Hispanic Marine Corps officers?

Each of the fitness report metrics in Table 49 shows significant differences between the average scores of Hispanic officer versus non-Hispanic officers. The *AvgRV_Proc* scores for Hispanics are .62 points lower than for non-Hispanics, representing a 3.1 percent difference. The RS cumulative score was also lower by .43 points (or 2.1 percent). The RO scores at processing and cumulative were also lower for Hispanics by .09 points (1.2%) and .08 points (1.2%), respectively.

Table 49.   T-test of Fitness Report Performance Variables

Variable	N	Full	Hispanic	Non-Hispanic	t-stat	Sign. Level
AvgRV_Proc	7639	92.1676	91.5795	92.2079	2.8568	***
AvgRV_Cum	7691	91.0403	90.6375	91.0678	2.6961	**
AvgRORV_Proc	7826	0.1344	0.0497	0.1402	2.6009	***
AvgRORV_Cum	7826	0.0318	-0.0455	0.0371	2.7022	***

Significance Level: * = .10 (1.282), ** = .05 (1.646), *** = .01 (2.330)

V. MODELS AND RESULTS

A. OVERVIEW

Chapter IV provides descriptive statistical analyses that sought to identify differences in variables that affect promotion, retention and performance between Hispanic and non-Hispanic Marine Corps officers. However, the descriptive statistics analyses did not simultaneously control for the effects that other factors can have on retention, promotion, and performance. To properly examine the independent effects of the explanatory variables while holding constant other factors, multivariate statistical analysis is needed. This chapter specifies and estimates multivariate models of retention, promotion and officer performance.

B. METHODOLOGY

A multivariate regression model estimates the effects of independent (control) variables on a dependent (outcome) variable. Because the outcome variables in this study, such as retention or promotion, are binary variables, the appropriate estimation model that handles such binary variables is either a probit or logit estimation technique. A probit model, shown in Figure 8, generates probit estimates, which tell us the sign of the effects of each independent variable on the dependent variable. Marginal effects can be calculated from the estimated probit coefficients, which provide an estimate of the increase or decrease in the probability of the binary response due to a unit change in the independent variables in the model. The probit model is based on the normal distribution of the cumulative distribution function (CDF), which coupled with the binary response dependent variable, provides the maximum likelihood estimation (MLE) dependent upon the distribution of y given x (Wooldridge, 2009, p. 578). Statistical software is used to find the partial derivative of these coefficients which provide the sign and magnitude of the marginal effect of each independent variable on the probability of the outcome, y (Wooldridge, 2009).

$$P(y = 1 \mid x) = G(\beta_0 + \mathbf{x}\boldsymbol{\beta})$$

Figure 8.   Probit Function

RS fitness reports are scored on an 80 to 100 scale, which is continuous. Hence, OLS regression techniques are used to estimate the coefficients of the explanatory variables in the RS fitness report score model. The coefficients in the OLS models are interpreted as the effect of a one unit increase in a given independent (control) variable on fitness report score, holding all other independent variables constant.

1.   Models Specification

The independent (control) variables used in each multivariate model are selected based on econometric theory, previous studies findings, and the institutional knowledge of what contributes to the outcomes measured by the dependent variables. Each model specification supports a research question addressed in this thesis. In addition, each independent variable needs to have sufficient observations to keep the validity of the model by maximizing the number of observations available for estimation.

Research question 1 examines factors that predict officer retention and promotion. Retention variables are generated at year 6 and year 10 after commissioning. Each variable encompasses the MSR for most officers and surpasses the years in which most first tour assignments are complete. Year 10 represents the career decision point for all junior officers. With pension eligibility at 20 years of active duty, the mid-point of year 10 signals an individual's intention of pursuing a military career and possibly toward senior leadership. Lastly, year 6 and year 10 indicate a level of experience that allows for informed decisions on future career experiences and expectations.

For the promotion part of research question 1, O4 is selected as the benchmark for the promotion variable. O4 is the first pay grade among the field grade officers and signals the intention of pursuing a military career and being a senior officer. Lastly, the

career designation process did not exist prior to 2008 (Garza, 2014) and, therefore, promotion to O4 acts as competitive assessment.

Research question 2a) investigates the effect of pre-entry education and test scores on officer career success. *GCT*, *TopColl*, *PriCollege*, *BacSTEM*, *Academy*, *NROTC*, *MECEP*, *OCC*, and *PLC* are variables that will be used to address the question. Each of these variables provides the maximum number of observations and captures education type, quality, and performance.

Research question 2b) focuses on TBS performance. The performance metric of *tbs_overall_gpa* is used to capture TBS performance. Additionally, overall GPA captures all three of the individual grades of Academics, Military Skills and Leadership.

Research question 2c) addresses MOS assignment. Five MOS categories are included in all models. Question 2d) is regarding the career experiences of officers following TBS. The variables for PFT scores, rifle and pistol qualifications, injured or wounded, awards, and deployments as measured by sea service deployment ribbons are included in each model. Each of these variables came from the cross-sectional variable list which provides information at each of the specified time periods.

Research question 2f) analyzes fitness report performance. Of the two fitness report scores available, the RS cumulative score of a fitness report is used to measure performance. The cumulative value is preferred for this study since it encompasses a larger number of observations and is more representative of the entire population. Additionally, the RS scores are included rather than the RO scores because the RS is the direct supervisor of the Marine reported on, and may be more knowledgeable about the Marine reported on.

C.   ESTIMATION MODELS

The following baseline models are used to answer the primary and secondary questions of this study. Cohort years are included in each model to account for any changes in policy over time that might affect each cohort differently.

When discussing the results for the probit estimating models, emphasis is placed on the sign (+ or -) of the coefficient of each independent variable included in the model, as well as the magnitude of the marginal effects, and statistical significance. Similarly, the coefficients from the OLS fitness report model will be scrutinized for their sign, magnitude and statistical significance.

The reference group in each model is a male, non-Hispanic, natural born citizen, bottom selectivity college graduate from a public college, with a non-STEM bachelor's degree, OCC accession source, combat arms MOS, not injured or wounded, and commissioned in 1999.

1. Retention Models Results

The first model is a probit retention model (Figure 9) that estimates the probability of retention after the MSR (6-year point). All cohorts from 1999 to 2004 are included in the sample.

The model specification includes demographic variables (gender, age, ethnicity, and citizenship) that have been shown in previous work to be related to retention decisions by officers. In addition, the model controls for education attainment, accession source, TBS performance, MOS category, and post-TBS events that also can affect an individual's retention decision. Lawyers and aviators are removed from the sample since their initial obligated service requirements may take them beyond year 6. Fitness report scores are not used as an independent variable in this model as the fitness report score is a relative value in comparison to all officers of the same grade, including those with more than six years of commissioned service. The resulting sample contains observations on 4,490 officers out of the original 7,780 observations.

$$P(\text{Retention}_{t+6}) = G(\beta_0 + \beta_1 \text{Demographics} + \beta_2 \text{Pre-entry Education} + \beta_3 \text{TBS} + \beta_4 \text{Post-TBS})$$

Figure 9.   Base Model for Retention at Year 6

70

The average retention rate at six years of active service for the sample is 67 percent. The results in Table 50 show that all four demographic variables are statistically significant at the 10 percent level or better. Specifically, one additional year of age at commissioning increases retention by 2.03 ppts. Females are less likely to stay compared with males, as shown by the negative marginal effect on the female dummy variable. Hispanic officers, and naturalized officers are more likely to stay, as compared with the non-Hispanics and U.S. born citizens, respectively. The retention rate of Hispanics is 5.9 ppts (or about 9% estimated at the mean retention rate of 67%) above that of non-Hispanics, and retention of naturalized citizens is 8.7 ppts (or 13%) above that of non-naturalized citizens.

Among the pre-entry education variables, seven of eight are statistically significant at the one percent level. Those with higher GCT scores or who graduated from a highly selective college or from a private college are more likely to leave the Marine Corps. This might be due to better civilian labor market opportunities for these highly qualified individuals. Officers from all four commissioning programs – Academy, NROTC, MECEP, and PLC – are more likely to stay than those who entered via the OCC program.

Among the post-entry variables, five of nine are statistically significant at the one percent level. Officers in the aviation ground MOS are more likely to retain than those serving in the combat arms MOS. Those with higher PFT scores are more likely to leave the Marine Corps, but the effect is very small. Those with higher rifle qualifications are more likely to stay in the Marine Corps. Being injured or wounded also increases retention by +19.7 ppts. The *Awards_6* coefficient is indicates that those with more awards are more likely (by 3.89 ppts) to stay in the Marine Corps.

Table 50.   Probit Year 6 Retention Model Results

VARIABLES	M.E.	VARIABLES	M.E.	VARIABLES	M.E.
Female	-0.0554**	MECEP	0.1450***	InjWounded_6	0.1971***
	(0.0274)		(0.0207)		(0.0406)
Hispanic	0.0590**	PLC	0.0664***	Awards_6	0.0389***
	(0.0270)		(0.0219)		(0.0026)
AGEatCOMM	0.0203***	BacSTEM	0.0162	SeaServRib_6	0.0042
	(0.0036)		(0.0176)		(0.0101)
Naturalized	0.0868*	tbs_overall_gpa	0.0003	commission 2000	-0.0840***
	(0.0458)		(0.0024)		(0.0277)
GCT	-0.0023***	css_mos	0.0160	commission 2001	-0.0933***
	(0.0008)		(0.0161)		(0.0281)
TopColl	-0.0529***	avgrd_mos	0.0719***	commission 2002	-0.0337
	(0.0155)		(0.0252)		(0.0273)
PriCollege	-0.0467***	PFT_6	-0.0017***	commission 2003	-0.0576**
	(0.0166)		(0.0004)		(0.0285)
Academy	0.1673***	HiRifQualYOAS_6	0.0701***	commission 2004	-0.0155
	(0.0188)		(0.0120)		(0.0268)
NROTC	0.0654***	HiPisQualYOAS_6	0.0079	Observations	4,490
	(0.0207)		(0.0119)	obs. P	0.678

Marginal Effect (M.E); Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

The year 6 retention model is re-estimated for sub-samples of Hispanics, and non-Hispanics to identify any differences in the effects of the explanatory variables on each ethnicity group. The results are presented in Table 51.

The average probability of retention for the Hispanic sub-sample is 75.4 percent, versus 67.1 percent for non-Hispanics. 16 of 19 variables in the non-Hispanic model are statistically significant (at the five percent level or better), whereas only four of the 19 variables in the Hispanic model are statistically significant. The difference in statistically significant variables is most likely due to small sample size for the Hispanic sub-sample, which has only 309 observations.

The common variables in each sub-sample with significant coefficients are *AGEatCOMM, GCT, Academy, and Award_6*. The direction for each coefficient is the same in both sub-samples with *AGEatCOMM, Academy,* and *Award_6* showing positive effects, and *GCT* showing a negative effect on retention. This indicates that the effect among Hispanics is similar to the effect among non-Hispanics with only varying magnitudes. One additional year

of age at commissioning increases retention by +3.17 ppts for Hispanics, and by only +1.9 ppts for non-Hispanics. One additional point on GCT scores lowers retention by -0.65 ppts for Hispanics, and by only -0.22 ppts for non-Hispanics. Academy graduates retain at higher rates than OCC commissioned officers, with the positive marginal effect being +16 ppts for both Hispanics and non-Hispanics. One additional award increases retention by +3 ppts for Hispanics and +3.9 ppts for non-Hispanics. While female non-Hispanics retain at the same rate as their male counterparts, Hispanic females retain at a lower rate, of -27.9 ppts, than male Hispanics. This indicates that Hispanic female officers separate at far higher rates than their non-Hispanic counterparts.

Table 51.   Probit 6 Year Retention Model Results for Hispanics and Non-Hispanics

VARIABLES	M.E. (non-Hispanics)	M.E. (Hispanics)	VARIABLES	M.E. (non-Hispanics)	M.E. (Hispanics)
Female	-0.0375	-0.2794***	avgrd_mos	0.0714***	0.0372
	(0.0285)	(0.1043)		(0.0267)	(0.0807)
AGEatCOMM	0.0198***	0.0317***	PFT_6	-0.0017***	-0.0012
	(0.0038)	(0.0117)		(0.0004)	(0.0013)
Naturalized	0.1261***	-0.0893	HiRifQualYOAS_6	0.0742***	-0.0094
	(0.0490)	(0.1090)		(0.0126)	(0.0424)
GCT	-0.0022**	-0.0065*	HiPisQualYOAS_6	0.0102	-0.0172
	(0.0009)	(0.0036)		(0.0124)	(0.0413)
TopColl	-0.0571***	0.0243	Awards_6	0.0396***	0.0304***
	(0.0162)	(0.0560)		(0.0027)	(0.0087)
PriCollege	-0.0447***	-0.0397	SeaServRib_6	0.0030	0.0253
	(0.0173)	(0.0586)		(0.0105)	(0.0353)
Academy	0.1669***	0.1696***	commission 2000	-0.0792***	-0.1655
	(0.0199)	(0.0469)		(0.0288)	(0.1112)
NROTC	0.0663***	0.0870	commission 2001	-0.0899***	-0.1466
	(0.0215)	(0.0722)		(0.0292)	(0.1114)
MECEP	0.1507***	0.0900	commission 2002	-0.0391	0.0526
	(0.0219)	(0.0625)		(0.0285)	(0.0905)
PLC	0.0631***	0.0692	commission 2003	-0.0603**	-0.0537
	(0.0231)	(0.0718)		(0.0297)	(0.1091)
BacSTEM	0.0193	-0.0317	commission 2004	-0.0125	-0.0884
	(0.0184)	(0.0634)		(0.0280)	(0.1024)
tbs_overall_gpa	0.0003	0.0027	Observations	4,170	309
	(0.0025)	(0.0085)			
css_mos	0.0160	0.0288	Hisp: obs. P		0.754
	(0.0168)	(0.0609)	Non-Hisp: obs P	0.671	

Marginal Effect (M.E); Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

73

The multivariate year 10 retention model (Figure 11) estimates the probability of retention after 10 years of active service. The sample for this model includes all MOS categories since most aviators and lawyers are eligible for separation by year 10. Additionally, fitness report scores are included since the increased reporting time allows for stabilization of scores relative to all other officers in the same grade. The resulting sample size is 5,084 out of the original 7,780 initial officer entrants. The missing observations in this sample are due to the removal of those who did not stay beyond year 6. Hence, this model captures the decision to stay of those who retain beyond their MSR.

$$P(\text{Retention}_{t+10}) = G(\beta_0 + \beta_1 Demographics + \beta_2 \text{Pre-entry Education} + \beta_3 \text{TBS} + \beta_4 \text{Post-TBS} + \beta_5 \text{Fitness Reports})$$

Figure 10.   Base Model for Retention at Year 10

The retention rate for the sample is 75.1 percent. The results of the model are presented in Table 52.

In Table 52 three of four demographic variables, four of eight pre-entry variables, and nine of 12 post-entry variables are statistically significant at the 10 percent level or better. The results show that naturalized citizens have retention rates that are +10.2 ppts above their counterparts, and that *Hispanics* have retention rates that are +4.7 ppts above non-Hispanics. The results also show that top college graduates are 5.2 ppts more likely to separate at the 10 year mark, possibly because of their better opportunities in the civilian labor market than those from lesser ranked colleges. MECEP graduates are 13.1 ppts more likely to stay. The MOS variable with the largest effect on retention is *air_mos* with retention at 10 years that is 22.4 ppts above those in Combat Arms. Each of the other MOS categories is also significant and positive in value in comparison to the reference category of Combat Arms. Among the other post-TBS variables, *HiRifQualYOAS_10* and *SeaServRib_10* positively affect retention by +6.5 ppts and +6.3 ppts, respectively. The fitness report score is also statistically significant indicating that

for every one unit change in the 20 point RS fitness report scale an individual is more likely to stay in the Marine Corps. The effect of fitness report is small with a +1.11 ppts effect on retention.

Among the cohort years, none of the cohort years are statistically significant, showing that cohorts 2000 to 2003 retain at the same rate as cohort 1999. Of additional note, the *Academy* coefficient went from significant and positive in the year 6 retention model to statistically insignificant in the year 10 retention model.

Table 52.　Probit Year 10 Retention Model Results

VARIABLES	M.E.	VARIABLES	M.E.	VARIABLES	M.E.
Female	-0.0043	PLC	0.0356**	InjWounded_10	-0.0029
	(0.0238)		(0.0175)		(0.0240)
Hispanic	0.0473**	BacSTEM	0.0215	Awards_10	0.0108***
	(0.0221)		(0.0138)		(0.0016)
AGEatCOMM	0.0144***	tbs_overall_gpa	0.0023	SeaServRib_10	0.0636***
	(0.0031)		(0.0021)		(0.0068)
Naturalized	0.1023***	css_mos	0.0889***	AvgRV_Cum_10	0.0111***
	(0.0331)		(0.0149)		(0.0022)
GCT	-0.0003	avgrd_mos	0.1276***	commission 2000	0.0142
	(0.0007)		(0.0171)		(0.0209)
TopColl	-0.0527***	law_mos	0.1407***	commission 2001	0.0050
	(0.0129)		(0.0172)		(0.0215)
PriCollege	-0.0256*	air_mos	0.2240***	commission 2002	-0.0119
	(0.0142)		(0.0130)		(0.0216)
Academy	-0.0178	PFT_10	-0.0004	commission 2003	-0.0362
	(0.0209)		(0.0003)		(0.0231)
NROTC	-0.0091	HiRifQualYOAS_10	0.0655***	commission 2004	-0.0155
	(0.0200)		(0.0116)		(0.0218)
MECEP	0.1316***	HiPisQualYOAS_10	0.0271**	Observations	5,084
	(0.0166)		(0.0108)	Obs. P	0.751

Marginal Effect (M.E); Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

The year 10 retention model is re-estimated for sub-samples of Hispanics and non-Hispanics to see the differences in the effects of the independent (control) variables on each group. The probability of retention at 10 years among Hispanics is 80.1 percent, larger than the 74.7 percent for non-Hispanics.

The common variables in each sub-sample with statistically significant coefficients are *AGEatCOMM, Naturalized, TopColl, MECEP, air_mos, HiRifQual, Award_10,* and *SeaServRib.* Similar to the year 6 retention model, the direction for each coefficient is the same in both sub-samples with all but *TopColl* having a positive effect on retention. This continues to indicate that the effect of the all the factors accounted for in the analysis is similar in statistical significance and direction among Hispanics and non-Hispanics, with only varying magnitudes.

Specifically, every additional year of age at commissioning increases retention at year 10 by +1.74 ppts for Hispanics, and by +1.37 for non-Hispanics. Among naturalized citizens in the sample, the effect on retention at 10 years is +13.08 ppts for Hispanics and +8.65 for non-Hispanics. The retention effect of attending a top quality college is -8.22 ppts for Hispanics, but only -4.93 for non-Hispanics. The effect of *MECEP* on retention is +11.28 ppts for Hispanics but +13.29 for non-Hispanics. Being in the *air_mos* is associated with a +10.51 ppts higher retention rate for Hispanics, and +23.21 ppts higher retention rate for non-Hispanics. The effect of rifle qualification is +9.2 ppts increased retention for Hispanics, compared with +6.57 ppts for non-Hispanics. Every additional award added to the total number of awards at year 10 increases retention by +9.8 ppts for Hispanics but +11.2 ppts for non-Hispanics. The *SeaServRib,* which measures deployment experience, has a +5.07 ppts effect on retention for Hispanics, compared with +6.5 ppts effect for non-Hispanics. In contrast to the year 6 retention model, Hispanic female officers retain at higher rates than their non-Hispanic counterparts.

Table 53.   Probit 10 Year Retention Model Results for Hispanic
and Non-Hispanics

VARIABLES	M.E. (non-Hispanics)	M.E. (Hispanics)	VARIABLES	M.E. (non-Hispanics)	M.E. (Hispanics)
Female	-0.0142	0.0871**	air_mos	0.2321***	0.1051***
	(0.0256)	(0.0426)		(0.0137)	(0.0407)
AGEatCOMM	0.0137***	0.0174*	PFT_10	-0.0004	0.0005
	(0.0032)	(0.0098)		(0.0003)	(0.0010)
Naturalized	0.0865**	0.1308***	HiRifQualYOAS_10	0.0657***	0.0920**
	(0.0400)	(0.0345)		(0.0120)	(0.0413)
GCT	-0.0003	0.0015	HiPisQualYOAS_10	0.0271**	0.0019
	(0.0008)	(0.0030)		(0.0113)	(0.0362)
TopColl	-0.0493***	-0.0822*	InjWounded_10	0.0016	-0.0451
	(0.0135)	(0.0449)		(0.0252)	(0.0736)
PriCollege	-0.0214	-0.1181**	Awards_10	0.0112***	0.0098*
	(0.0147)	(0.0581)		(0.0017)	(0.0052)
Academy	-0.0195	-0.0083	SeaServRib_10	0.0650***	0.0507**
	(0.0218)	(0.0696)		(0.0071)	(0.0218)
NROTC	-0.0067	-0.0872	AvgRV_Cum_10	0.0114***	0.0038
	(0.0206)	(0.1021)		(0.0023)	(0.0079)
MECEP	0.1329***	0.1128**	commission 2000	0.0219	-0.0440
	(0.0175)	(0.0469)		(0.0215)	(0.0798)
PLC	0.0398**	-0.0556	commission 2001	0.0101	-0.0239
	(0.0182)	(0.0751)		(0.0223)	(0.0754)
BacSTEM	0.0172	0.0759*	commission 2002	-0.0106	0.0232
	(0.0145)	(0.0391)		(0.0225)	(0.0670)
tbs_overall_gpa	0.0029	-0.0063	commission 2003	-0.0281	-0.1155
	(0.0022)	(0.0071)		(0.0238)	(0.1041)
css_mos	0.0916***	0.0554	commission 2004	-0.0070	-0.1014
	(0.0155)	(0.0494)		(0.0224)	(0.0950)
avgrd_mos	0.1354***	0.0523	Observations	4,746	338
	(0.0175)	(0.0581)			
law_mos	0.1450***	0.0762	Hisp: obs. P		0.801
	(0.0177)	(0.0672)	non-Hisp: obs. P	0.747	

Marginal Effect (M.E); Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

2.   Promotion Models Results

The multivariate O4 promotion model is specified in Figure 11. This model includes all MOS categories and RS fitness report scores, because all MOS categories are eligible for promotion by year 10 and fitness report scores are critical in measuring individual performance. All those who did not stay beyond year 6 are removed from the sample. Therefore, the sample used to estimate promotion models include only 5,144 observations, as compared with the original 7,780 observations. The sample size varies

from the year 10 retention model because a different list of independent variables is used in the promotion model; with some missing observations among those variables, the resulting sample is smaller than the sample used for the 10 year retention model estimations.

$$P(\text{Promotion to O4}) = G(\beta_0 + \beta_1 Demographics + \beta_2 \text{Pre-entry Education} + \beta_3 \text{TBS} + \beta_4 \text{Post-TBS} + \beta_5 \text{Fitness Reports})$$

Figure 11.   Base Model for Promotion to O4

The sample probability of promotion is 70.5 percent. The results of estimating the promotion model are displayed in Table 54.

The pre-entry variables with the largest estimated promotion effects are *Academy* (-10.67 ppts) and *MECEP* (-8.37 ppts), showing that Academy graduates and officers commissioned through MECEP are less likely to promote, compared to non-Academy graduates, and OCC commissioned officers, respectively. The negative effect on *MECEP* is somewhat surprising given the positive effect it has on retention and performance, as is indicated earlier in this chapter. Some unobserved variables that may explain this result could be non-completion of PME or a request for retirement. Retirement eligibility for officers only occurs after serving 10 years as a commissioned officer in a 20-year career. With MECEP officers having prior service time as an enlisted Marine, it is likely that they will choose retirement after reaching the 10 year mark rather than accepting promotion to O4 and the additional service obligation that accompanies a promotion.

The *tbs_overall_gpa* has a small significant and positive effect on promotion (+0.88 ppts). The MOS variables that show the largest effects on promotion to O4 are *air_mos* and *law_mos* with effects of +15.69 ppts and +20.7 ppts, respectively, showing that officers in these MOSs promote at higher rates than officers serving in Combat Arms, the benchmark comparison group. Each of the other MOS categories is also significant and positive in comparison to the reference category of Combat Arms. Among the other post-TBS variables, *HiRifQualYOAS_10* increases promotion by +3.9 ppts for

every additional point toward an expert qualification. The fitness report score is also statistically significant indicating that for every one unit change in the 20-point RS fitness report scale an individual is more likely to be promoted. The effect of fitness report score on promotion is +3.2 ppts.

Among the cohort years, the coefficients for cohort years 2001 through 2004 are all negative (compared to 1999), with 2004 having promotion rates 28.8 ppts below promotion rates in the 1999 cohort. The most significant policy changes during this time frame are associated with the Global War on Terror (GWOT) and the downsizing of the military that occurred following the end of major combat operations in the areas associated with GWOT. Prior to 2012, the Marine Corps sought a promotion rate of 90 percent in its precepts to the promotion boards (https://www.manpower.usmc.mil/portal /page/portal/M_RA_HOME/MM/F_PR/). Subsequently, the rate was reduced to 85 percent which affects the older cohorts of this study.

Of additional note, the *TopColl* and *PriCollege* variables both have significant negative effects on promotion to O4. The marginal promotion effects of *TopColl* and *PriCollege* are -2.5 ppts and -3.3 ppts, respectively. These variables have maintained similar significance and magnitude in each of the retention models and signal a similar effect on the promotion model. It is noted that in the promotion model *Naturalized* is not statistically significant, showing that promotion rates for citizens and naturalized citizens are no different. This is contrary to all of the retention models in which *Naturalized* has positive retention effects.

Additionally, although there were significant differences in retention between Hispanics and non-Hispanics, there is no difference between the two groups in promotion rates. This indicates that ethnicity is not an important factor in explaining promotion of Marine officers.

Table 54.   Promotion to O4 Probit Model Results

VARIABLES	M.E.	VARIABLES	M.E.	VARIABLES	M.E.
Female	-0.0157	PLC	0.0001	InjWounded_10	-0.0420
	(0.0270)		(0.0212)		(0.0267)
Hispanic	0.0179	BacSTEM	-0.0071	Awards_10	0.0180***
	(0.0256)		(0.0155)		(0.0018)
AGEatCOMM	0.0014	tbs_overall_gpa	0.0088***	SeaServRib_10	0.0199***
	(0.0032)		(0.0023)		(0.0069)
Naturalized	-0.0017	css_mos	0.0514***	AvgRV_Cum_10	0.0317***
	(0.0439)		(0.0178)		(0.0024)
GCT	-0.0007	avgrd_mos	0.0859***	commission 2000	0.0067
	(0.0008)		(0.0254)		(0.0241)
TopColl	-0.0252*	law_mos	0.2079***	commission 2001	-0.0412
	(0.0143)		(0.0181)		(0.0254)
PriCollege	-0.0339**	air_mos	0.1569***	commission 2002	-0.1183***
	(0.0154)		(0.0164)		(0.0263)
Academy	-0.1067***	PFT_10	0.0010***	commission 2003	-0.1320***
	(0.0253)		(0.0003)		(0.0276)
NROTC	-0.0317	HiRifQualYOAS_10	0.0390***	commission 2004	-0.2884***
	(0.0236)		(0.0130)		(0.0271)
MECEP	-0.0837***	HiPisQualYOAS_10	0.0130	Observations	5,144
	(0.0250)		(0.0120)	obs. P	0.705

Marginal Effects (M.E.); Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

In Table 55, the promotion to O4 model is re-estimated to examine possible differences in the effects of the explanatory variables on the rate of promotion among Hispanics and non-Hispanics. The sample average probability for promotion among Hispanics is 69.2 percent, and 70.6 percent for non-Hispanics.

The explanatory variables in each sub-sample that were statistically significant for both samples, Hispanics and non-Hispanics, are *PriCollege, MECEP, tbs_overall_gpa, css_mos, Award_10,* and *AvgRV_Cum_10.* Unlike the retention models, all variable had the same direction and magnitude for the two samples, except *css_mos.* The effect on promotion for non-Hispanic officers in the CSS MOS is +6.5 ppts higher than Combat Arms, yet for Hispanics it is -17.7 ppts lower in the CSS MOS than in Combat Arms.

This difference might be explained by the large representation of Hispanics in the CSS MOS category.

The variables which have positive effects on promotion for both sub-samples are *tbs_overall_gpa, Awards_10,* and *AvgRV_Cum_10*. Every additional point in the TBS overall GPA increases the promotion probability by +1.84 ppts for Hispanics, but by only +0.85 ppts for non-Hispanics. Every additional award earned by Hispanics increases the promotion probability by +1.63 ppts, and by +1.81 ppts for non-Hispanics. Every additional point in the average RS relative value score increases promotion probability by +3.94 ppts (or 5.6 percent at the mean promotion rate) for Hispanics and by +3.1 ppts (or 4.4 percent) for non-Hispanics. These effects are practically significant.

The variables with negative effects for both Hispanics and non-Hispanics are *PriCollege* and *MECEP*. The effect of attending a private college on promotion probability is -14.2 ppts lower for Hispanics (as compared attending a public college), and -3.0 ppts lower for non-Hispanics. Thus, for Hispanics, attending a private college has a sizeable negative effect on promotion of about 20.2 percent, which is much larger than the private college effect for non-Hispanics promotion rates. Similarly, MECEP graduates are -29.24 ppts (or 41.7 percent) lower for Hispanics, but only 6.34 ppts lower for non-Hispanics. The effects of attending a private college and commissioning via MECEP are large for Hispanic officers. The summary statistics in Chapter IV indicated that Hispanics attended private colleges and access through MECEP in higher percentages than non-Hispanics, which may amplify the effect of promotion probability.

Table 55. Promotion to O4 Probit Model Results For Hispanics and Non-Hispanics

VARIABLES	M.E. (non-Hispanics)	M.E. (Hispanics)	VARIABLES	M.E. (non-Hispanics)	M.E. (Hispanics)
Female	-0.0265	0.0924	air_mos	0.1682***	-0.1239
	(0.0286)	(0.0781)		(0.0167)	(0.1006)
AGEatCOMM	0.0002	0.0043	PFT_10	0.0011***	0.0004
	(0.0034)	(0.0124)		(0.0003)	(0.0013)
Naturalized	-0.0584	0.2107***	HiRifQualYOAS_10	0.0435***	-0.0192
	(0.0536)	(0.0488)		(0.0133)	(0.0617)
GCT	-0.0009	0.0046	HiPisQualYOAS_10	0.0127	0.0144
	(0.0008)	(0.0040)		(0.0124)	(0.0502)
TopColl	-0.0182	-0.1510**	InjWounded_10	-0.0296	-0.1908*
	(0.0148)	(0.0596)		(0.0279)	(0.1006)
PriCollege	-0.0300*	-0.1421**	Awards_10	0.0181***	0.0163**
	(0.0159)	(0.0708)		(0.0018)	(0.0066)
Academy	-0.1066***	-0.1775	SeaServRib_10	0.0214***	0.0146
	(0.0261)	(0.1218)		(0.0072)	(0.0256)
NROTC	-0.0336	0.0297	AvgRV_Cum_10	0.0310***	0.0394***
	(0.0241)	(0.1153)		(0.0025)	(0.0106)
MECEP	-0.0634**	-0.2924***	commission 2000	0.0090	0.0283
	(0.0260)	(0.0888)		(0.0249)	(0.0976)
PLC	0.0013	-0.0618	commission 2001	-0.0300	-0.1205
	(0.0218)	(0.1028)		(0.0260)	(0.1066)
BacSTEM	-0.0032	-0.0553	commission 2002	-0.1109***	-0.2115*
	(0.0160)	(0.0692)		(0.0271)	(0.1166)
tbs_overall_gpa	0.0085***	0.0184*	commission 2003	-0.1153***	-0.3902***
	(0.0024)	(0.0099)		(0.0282)	(0.1272)
css_mos	0.0650***	-0.1774**	commission 2004	-0.2739***	-0.5150***
	(0.0181)	(0.0778)		(0.0280)	(0.1082)
avgrd_mos	0.0989***	-0.1532	Observations	4,799	345
	(0.0255)	(0.1346)			
law_mos	0.2187***	-0.1976	Hisp: Predicted Prob.		0.692
	(0.0168)	(0.2117)	non-Hisp: Predicted Prob	0.706	

Marginal Effects (M.E.); Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

3.   Fitness Report Score Model Results

The multivariate OLS performance model is specified in Figure 13. This model estimates the effect of demographics, pre-entry and post-entry variables on fitness report performance, as measured by RS cumulative fitness report scores. This model specification includes all MOS categories. All those who were not retained at year 10 are removed from the sample for this estimation, generating a sample size of 3,879.

$$\text{Fitness Report Score} = f\,(\beta_0 + \beta_1 Demographics + \beta_2 \text{Pre-entry Education} + \beta_3 \text{TBS} + \beta_4 \text{Post-TBS})$$

Figure 12.   Base Fitness Report Model

The RS cumulative fitness report model estimates, presented in Table 56, shows the effect of each control variable on the outcome variable. Being a naturalized citizen reduces the RS score by 0.745 points. Being a *PLC* graduate reduces the RS score by 0.434 points and serving in an aviation MOS reduces it by 0.507 points. On the-20 point RS fitness report scale (which ranges from 80 to 100) and with a mean score of 91.04 for the entire sample, the effects of *Naturalized PLC,* and *air_mos* are -practically insignificant with differences of less than one percent. As discussed in the background chapter, the negative effect of being a naturalized citizen may be due to their lower English language or communication skills. Officers accessed through the PLC program may have less exposure to the military environment which may manifest itself in lower fitness report performance. The aviation MOS is much more isolated than the other MOS categories and therefore the negative effects may be indicative of differences in grading scales. Another possible explanation is due to the limited exposure that aviators get to areas outside their specialty. This may affect their performance in comparison to other MOS categories whose exposure is broader.

Female officers have RS fitness reports that are higher than males by 0.548 points. *MECEP graduates* score higher (than OCC graduates) by 0.492 points. Officers

with higher TBS overall GPA receive higher fitness report scores by 0.345 points , and those serving in aviation ground MOS score higher by 0.842 points . However, once again the magnitudes of these effects are very small and, thus, are practically insignificant. The positive effect of *MECEP* and TBS performance are potentially due to the experience and proficiency that are associated with these variables. MECEP Marines are previously enlisted and have exposure and experience in the Marine Corps and military environment. Those that do well at TBS have demonstrated a greater proficiency in military skills and leadership which are also traits that heavily influence fitness report performance.

The *MECEP* effect on fitness report scores is nearly double that of the other accessions sources. As previously mentioned, MECEP graduates are prior enlisted Marines who have more years of experience over those that come from the PLC program who have only 10 weeks exposure at OCS.

Table 56.   Fitness Report Score OLS Model Results

VARIABLES	M.E.	VARIABLES	M.E.	VARIABLES	M.E.
Female	0.5486***	PLC	-0.4341***	InjWounded_10	0.0452
	(0.1938)		(0.1399)		(0.1811)
Hispanic	-0.1992	BacSTEM	-0.0843	Awards_10	0.1087***
	(0.1721)		(0.1010)		(0.0106)
AGEatCOMM	-0.0738***	tbs_overall_gpa	0.3451***	SeaServRib_10	-0.1871***
	(0.0206)		(0.0149)		(0.0428)
Naturalized	-0.7458***	css_mos	0.2352*	commission 2000	-0.0376
	(0.2714)		(0.1316)		(0.1540)
GCT	-0.0147***	avgrd_mos	0.8425***	commission 2001	-0.1271
	(0.0055)		(0.2041)		(0.1569)
TopColl	-0.0351	law_mos	0.4584	commission 2002	0.0712
	(0.0949)		(0.2913)		(0.1574)
PriCollege	0.1156	air_mos	-0.5075***	commission 2003	0.5382***
	(0.1006)		(0.1284)		(0.1640)
Academy	0.2372	PFT_10	0.0104***	commission 2004	0.1542
	(0.1602)		(0.0022)		(0.1597)
NROTC	0.2074	HiRifQualYOAS_10	-0.1529	Constant	60.8118***
	(0.1573)		(0.0984)		(1.3858)
MECEP	0.4925***	HiPisQualYOAS_10	-0.0579	Observations	3,879
	(0.1405)		(0.0840)	R-squared	0.227

Marginal Effects; Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

In Table 57, the fitness report performance model is re-estimated for sub-samples of Hispanics and non-Hispanics. The common variables in each sub-sample with significant coefficients are *Female, PLC, tbs_overall_gpa, avgrd_mos, PFT_10*, and *Award_10*. Similar to the retention models, all of these variables have the same direction and magnitude which indicates that the effects of each variable on performance are similar among Hispanics and non-Hispanics. Each of the mentioned variables has a positive effect, with the exception of *PLC*. The negative effect on performance for PLC officers is -0.397 points (1.98%) for Hispanics but -1.09 points (5.45%) for non-Hispanic officers. The representation of Hispanics and non-Hispanics in the PLC program is similar as shown in Table 45.

Female has a positive effect of 0.458 points (2.29%) on fitness report scores for Hispanics the effect is only 1.37 points (6.85%) for non-Hispanics. Each additional point in TBS GPA, increases fitness report performance for Hispanics by 0.340 points (1.7%) but increases scores by +0.404 points (2.02%) for non-Hispanics. Those serving in the aviation ground MOS category have fitness report scores that are 0.779 points (3.89%) higher (than combat arms) among Hispanics but 1.62 (8.1%) higher among non-Hispanics. For every additional point on the PFT, the fitness report score increases by 0.009 points (0.045%) for Hispanics but increases by 0.02 pts (0.1%) for non-Hispanics. The effect of an additional award increases the fitness report score by 0.105 pts (0.52%) for Hispanics but by 0.133 pts (0.66%) for non-Hispanics. Among these positive effects, all of the estimated effects were larger for non-Hispanics. The explanation for the cognitive-related variables may be associated with educational differences between Hispanics and non-Hispanics as discussed in Chapter II. The effect of *Awards_10* may be due to the concentration of Hispanic officers in the CSS MOS category.

Table 57. Fitness Report Performance Model for Hispanic
and Non-Hispanic Sub-samples

VARIABLES	M.E. (non-Hispanics)	M.E. (Hispanics)	VARIABLES	M.E. (non-Hispanics)	M.E. (Hispanics)
Female	1.3759**	0.4587**	air_mos	-0.0742	-0.5332***
	(0.6384)	(0.2050)		(0.5278)	(0.1331)
AGEatCOMM	-0.0642	-0.0737***	PFT_10	0.0229***	0.0092***
	(0.0718)	(0.0216)		(0.0079)	(0.0023)
Naturalized	-0.4111	-0.8791***	HiRifQualYOAS_10	-0.2421	-0.1437
	(0.5808)	(0.3117)		(0.4212)	(0.1016)
GCT	-0.0299	-0.0140**	HiPisQualYOAS_10	-0.1581	-0.0544
	(0.0257)	(0.0056)		(0.3136)	(0.0875)
TopColl	-0.3827	-0.0012	InjWounded_10	0.0578	0.0472
	(0.3761)	(0.0985)		(0.7299)	(0.1873)
PriCollege	0.2570	0.1064	Awards_10	0.1330***	0.1055***
	(0.4047)	(0.1046)		(0.0411)	(0.0110)
Academy	0.6783	0.2102	SeaServRib_10	-0.2213	-0.1806***
	(0.6391)	(0.1663)		(0.1539)	(0.0448)
NROTC	-0.0242	0.2366	commission 2000	0.0424	-0.0551
	(0.8064)	(0.1611)		(0.5691)	(0.1606)
MECEP	0.3334	0.5148***	commission 2001	-0.1831	-0.1442
	(0.4412)	(0.1491)		(0.5683)	(0.1639)
PLC	-1.0993*	-0.3970***	commission 2002	-0.0815	0.0663
	(0.5837)	(0.1446)		(0.5892)	(0.1638)
BacSTEM	-0.6301	-0.0351	commission 2003	1.3234**	0.4761***
	(0.4152)	(0.1047)		(0.6661)	(0.1701)
tbs_overall_gpa	0.4047***	0.3408***	commission 2004	-0.1904	0.1535
	(0.0548)	(0.0156)		(0.6601)	(0.1654)
css_mos	0.2012	0.2555*	Constant	54.2474***	61.3957***
	(0.4601)	(0.1378)		(5.1571)	(1.4464)
avgrd_mos	1.6222**	0.7798***			
	(0.7005)	(0.2141)			
law_mos	0.7832	0.4489	Observations	3,601	3,601
	(1.2112)	(0.3016)	R-squared	0.360	0.219

Marginal Effects; Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

VI. CONCLUSIONS AND RECOMMENDATIONS

A. CONCLUSIONS

The purpose of this thesis was to address the underrepresentation of Hispanics among Marine Corps leadership and to identify the factors that affect retention, promotion and performance of different ethnic groups. Using multivariate models that control for demographics, pre-entry education and post-entry variables, the main results show that the probability for retention after six years of service for Hispanics is 8.7% greater than that of non-Hispanics. At year 10, the difference in retention rates diminishes between Hispanics and non-Hispanics, although it is still higher for Hispanics by 6.3%. The promotion to O4 model and the fitness report performance model results find no significant effects of ethnicity, which indicates that Hispanics are treated no differently than non-Hispanics in terms of these outcome variables. The results from the 10 year retention model support the recommendations made in this thesis toward increasing Hispanic representation among senior Marine Corps leaders.

Among the factors with negative effects on retention are those in which Hispanics have lower representation. For instance, graduates of top quality or private colleges are less likely to stay and to promote. These individuals may have greater employment opportunities outside the military or may not find the military environment conducive to their future careers. Regardless of the potential rationale behind why this occurs, Hispanics are underrepresented among graduates of top quality or private colleges, as seen in Table 45, and this may partially explain why Hispanic retention is greater than non-Hispanics. The effect of *MECEP* increases retention at year 10 by 17.5% and 29.8% from the aviation MOS. These two variables were significant and had the largest positive effect on the year 10 retention model. MECEP participation among Hispanics is 43 percent higher than for non-Hispanics. MECEP Marines have more military experience than most newly commissioned officers since they were previously enlisted. Therefore, higher retention rates among Hispanics may also be explained by the higher likelihood that Hispanic officers had previous military experience. Additionally, non-Hispanic participation in the aviation MOS is 41 percent higher than for Hispanics. With the

positive effect of the aviation MOS on retention, an increase in Hispanic representation in this MOS category would further improve Hispanic retention.

B.   RECOMMENDATION

Promotion rates to O4 being nearly the same for Hispanics and non-Hispanics signals that, over time, the influence of the variables representing an officer's career experiences are equalizing. In other words, regardless of a new entrant's demographics, educational attainment or retention probability, their likelihood of being promoted to O4 is nearly equal. If the end goal is to see more Hispanic representation in the senior officer ranks of the Marine Corps, the results of this study suggest that an increase of Hispanics in the officer applicant pool is preferred rather than looking to increase the promotion rate of those that are currently serving.

One recommendation is to shift the recruiting focus away from higher quality schools as a source for officer applicants. This study finds that Marine Corps officers who attended these schools are less likely to be retained and to be promoted, as they might find the civilian employment opportunities more appealing. Additionally, the pool of qualified minority applicants at these schools is smaller than in other schools. An expansion or shift of NROTC, MECEP and other scholarship programs to schools with larger Hispanic populations could increase the Hispanic representation among Marine Corps officers while potentially increasing performance and retention rates.

APPENDIX A. FITNESS REPORT

COMMANDANT'S GUIDANCE

DO NOT STAPLE
THIS FORM

The completed fitness report is the most important information component in manpower management. It is the primary means of evaluating a Marine's performance and is the Commandant's primary tool for the selection of personnel for promotion, augmentation, resident schooling, command, and duty assignments. Therefore, the completion of this report is one of an officer's most critical responsibilities. Inherent in this duty is the commitment of each Reporting Senior and Reviewing Officer to ensure the integrity of the system by giving close attention to accurate marking and timely reporting. Every officer serves a role in the scrupulous maintenance of this evaluation system, ultimately important to both the individual and the Marine Corps. Inflationary markings only serve to dilute the actual value of each report. Reviewing Officers will not concur with inflated reports.

A. ADMINISTRATIVE INFORMATION

1. Marine Reported On:

a. Last Name	b. First Name	c. MI	d. SSN	e. Grade	f. DOR	g. PMOS	h. BILMOS

2. Organization:

a. MCC	b. RUC	c. Unit Description

3. Occasion and Period Covered: / **4. Duty Assignment (descriptive title):**

a. OCC	b. From	To	c. Type	4. Duty Assignment

5. Special Case:
a. Adverse ☐ b. Not Observed ☐ c. Extended ☐

6. Marine Subject Of:
a. Commendatory Material ☐ b. Derogatory Material ☐ c. Disciplinary Action ☐

7. Recommended For Promotion:
a. Yes ☐ b. No ☐ c. N/A ☐

8. Special Information:

a. QUAL		d. HT(in.)		g. Reserve Component	
b. PFT		e. WT		h. Status	
c. CFT		f. Body Fat		i. Future Use	

9. Duty Preference:
a. Code b. Descriptive Title

	a. Code	b. Descriptive Title
1st		
2nd		
3rd		

10. Reporting Senior:

a. Last Name	b. Init	c. Service	d. SSN	e. Grade	f. Duty Assignment

11. Reviewing Officer:

a. Last Name	b. Init	c. Service	d. SSN	e. Grade	f. Duty Assignment

B. BILLET DESCRIPTION

C. BILLET ACCOMPLISHMENTS

1. Marine Reported On
a. Last Name   b. First Name   c. MI   d. SSN   2. Occasion and Period Covered:
    a. OCC   b. From   To

D. MISSION ACCOMPLISHMENT

1. PERFORMANCE. Results achieved during the reporting period. How well those duties inherent to a Marine's billet, plus all additional duties, formally and informally assigned, were carried out. Reflects a Marine's aptitude, competence, and commitment to the unit's success above personal reward. Indicators are time and resource management, task prioritization, and tenacity to achieve positive ends consistently.

ADV	Meets requirements of billet and additional duties. Aptitude, commitment, and competence meet expectations. Results maintain status quo.	Consistently produces quality results while measurably improving unit performance. Habitually makes effective use of time and resources; improves billet procedures and products. Positive impact extends beyond billet expectations.		Results far surpass expectations. Recognizes and exploits new resources; creates opportunities. Emulated; sought after as an expert with influence beyond unit. Impact significant; innovative approaches to problems produce significant gains in quality and	N/O
A ☐	B ☐	C ☐	D ☐	E ☐	F ☐	G ☐ H ☐

2. PROFICIENCY. Demonstrates technical knowledge and practical skill in the execution of the Marine's overall duties. Combines training, education and experience. Translates skills into actions which contribute to accomplishing tasks and missions. Imparts knowledge to others. Grade dependent.

ADV	Competent. Possesses the requisite range of skills and knowledge commensurate with grade and experience. Understands and articulates basic functions related to mission.	Demonstrates mastery of all required skills. Expertise, education and experience consistently enhance mission accomplishment. Innovative troubleshooter and problem solver. Effectively imparts skills to subordinates.		True expert in field. Knowledge and skills impact far beyond those of peers. Translates broad-based education and experience into forward thinking, innovative actions. Makes immeasurable impact on mission accomplishment. Peerless teacher, selflessly imparts expertise to subordinates, peers, and	N/O
A ☐	B ☐	C ☐	D ☐	E ☐	F ☐	G ☐ H ☐

JUSTIFICATION:

E. INDIVIDUAL CHARACTER

1. COURAGE. Moral or physical strength to overcome danger, fear, difficulty or anxiety. Personal acceptance of responsibility and accountability, placing conscience over competing interests regardless of consequences. Conscious, overriding decision to risk bodily harm or death to accomplish the mission or save others. The will to persevere despite uncertainty.

ADV	Demonstrates inner strength and acceptance of responsibility commensurate with scope of duties and experience. Willing to face moral or physical challenges in pursuit of mission accomplishment.	Guided by conscience in all actions. Proven ability to overcome danger, fear, difficulty or anxiety. Exhibits bravery in the face of adversity and uncertainty. Not deterred by morally difficult situations or hazardous responsibilities.		Uncommon bravery and capacity to overcome obstacles and inspire others in the face of moral dilemma or life-threatening danger. Demonstrated under the most adverse conditions. Selfless. Always places conscience over competing interests regardless of physical or personal consequences.	N/O
A ☐	B ☐	C ☐	D ☐	E ☐	F ☐	G ☐ H ☐

2. EFFECTIVENESS UNDER STRESS. Thinking, functioning and leading effectively under conditions of physical and/or mental pressure. Maintaining composure appropriate for the situation, while displaying steady purpose of action, enabling one to inspire others while continuing to lead under adverse conditions. Physical and emotional strength, resilience and endurance are elements.

ADV	Exhibits discipline and stability under pressure. Judgment and effective problem-solving skills are evident.	Consistently demonstrates maturity, mental agility, and willpower during periods of adversity. Provides order to chaos through the application of intuition, problem-solving skills, and leadership. Composure reassures others.		Demonstrates seldom-matched presence of mind under the most demanding circumstances. Stabilizes any situation through the resolute and timely application of direction, focus and personal presence.	N/O
A ☐	B ☐	C ☐	D ☐	E ☐	F ☐	G ☐ H ☐

3. INITIATIVE. Action in the absence of specific direction. Seeing what needs to be done and acting without prompting. The instinct to begin a task and follow through energetically on one's own accord. Being creative, proactive and decisive. Transforming opportunity into action.

ADV	Demonstrates willingness to take action in the absence of specific direction. Acts commensurate with grade, training and experience.	Self-motivated and action-oriented. Foresight and energy consistently transform opportunity into action. Develops and pursues creative, innovative solutions. Acts without prompting. Self-starter.		Highly motivated and proactive. Displays exceptional awareness of surroundings and environment. Uncanny ability to anticipate mission requirements and quickly formulate original, far-reaching solutions. Always takes decisive, effective action.	N/O
A ☐	B ☐	C ☐	D ☐	E ☐	F ☐	G ☐ H ☐

JUSTIFICATION:

90

1. Marine Reported On:
a. Last Name   b. First Name   c. MI   d. SSN   2. Occasion and Period Covered
a. OCC   b. From   To

F. LEADERSHIP

1. LEADING SUBORDINATES. The inseparable relationship between leader and led. The application of leadership principles to provide direction and motivate subordinates. Using authority, persuasion, and personality to influence subordinates to accomplish assigned tasks. Sustaining motivation and morale while maximizing subordinates performance.

ADV							N/O
Engaged; provides instructions and directs execution. Seeks to accomplish mission in ways that sustain motivation and morale. Actions contribute to unit effectiveness.	Achieves a highly effective balance between direction and delegation. Effectively tasks subordinates and clearly delineates standards expected. Enhances performance through constructive supervision. Fosters motivation and enhances morale. Builds and sustains teams that successfully meet mission requirements. Encourages initiative and candor among subordinates.		Promotes creativity and energy among subordinates by striking the ideal balance of direction and delegation. Achieves highest levels of performance from subordinates by encouraging individual initiative. Engenders willing subordination, loyalty, and trust that allow subordinates to overcome their perceived limitations. Personal leadership fosters highest levels of motivation and morale, ensuring mission accomplishment even in the most difficult circumstances.				

A ☐   B ☐   C ☐   D ☐   E ☐   F ☐   G ☐   H ☐

2. DEVELOPING SUBORDINATES. Commitment to train, educate, and challenge all Marines regardless of race, religion, ethnic background, or gender. Mentorship. Cultivating professional and personal development of subordinates. Developing team players and esprit de corps. Ability to combine teaching and coaching. Creating an atmosphere tolerant of mistakes in the course of learning.

ADV							N/O
Maintains an environment that allows personal and professional development. Ensures subordinates participate in all mandated development programs.	Develops and institutes innovative programs, to include PME, that emphasize personal and professional development of subordinates. Challenges subordinates to exceed their perceived potential thereby enhancing unit morale and effectiveness. Creates an environment where all Marines are confident to learn through trial and error. As a mentor, prepares subordinates for increased responsibilities and duties.		Widely recognized and emulated as a teacher, coach and leader. Any Marine would desire to serve with this Marine because they know they will grow personally and professionally. Subordinate and unit performance far surpassed expected results due to MRO's mentorship and team building talents. Attitude toward subordinate development is infectious, extending beyond the unit.				

A ☐   B ☐   C ☐   D ☐   E ☐   F ☐   G ☐   H ☐

3. SETTING THE EXAMPLE. The most visible facet of leadership: how well a Marine serves as a role model for all others. Personal action demonstrates the highest standards of conduct, ethical behavior, fitness, and appearance. Bearing, demeanor, and self-discipline are elements.

ADV							N/
Maintains Marine Corps standards for appearance, weight, and uniform wear. Sustains required level of physical fitness. Adheres to the tenets of the Marine Corps core values.	Personal conduct on and off duty reflects highest Marine Corps standards of integrity, bearing and appearance. Character is exceptional. Actively seeks self-improvement in wide-ranging areas. Dedication to duty and professional example encourage others.		Model Marine, frequently emulated. Exemplary conduct, behavior, and actions are tone-setting. An inspiration to subordinates, peers, and seniors. Remarkable dedication to improving self and others.				

A ☐   B ☐   C ☐   D ☐   E ☐   F ☐   G ☐   H ☐

4. ENSURING WELL-BEING OF SUBORDINATES. Genuine interest in the well-being of Marines. Efforts enhance subordinates' ability to concentrate/focus on unit mission accomplishment. Concern for family readiness is inherent. The importance placed on welfare of subordinates is based on the belief that Marines take care of their own.

ADV							N/O
Deals confidently with issues pertinent to subordinate welfare and recognizes suitable courses of action that support subordinates' well-being. Applies available resources, allowing subordinates to effectively concentrate on the mission.	Instills and/or reinforces a sense of responsibility among junior Marines for themselves and their subordinates. Actively fosters the development of and uses support systems for subordinates which improve their ability to contribute to unit mission accomplishment. Efforts to enhance subordinate welfare improve the unit's ability to accomplish its mission.		Noticeably enhances subordinates' well-being, resulting in a measurable increase in unit effectiveness. Maximizes unit and base resources to provide subordinates with the best support available. Proactive approach serves to energize unit members to "take care of their own," thereby correcting potential problems before they can hinder subordinates' effectiveness. Widely recognized for techniques and policies that produce results and build morale. Builds strong family atmosphere. Puts motto Mission first, Marines always, into action.				

A ☐   B ☐   C ☐   D ☐   E ☐   F ☐   G ☐   H ☐

5. COMMUNICATION SKILLS. The efficient transmission and receipt of thoughts and ideas that enable and enhance leadership. Equal importance given to listening, speaking, writing, and critical reading skills. Interactive, allowing one to perceive problems and situations, provide concise guidance, and express complex ideas in a form easily understood by everyone. Allows subordinates to ask questions, raise issues and concerns and venture opinions. Contributes to a leader's ability to motivate as well as counsel.

ADV							N/O
Skilled in receiving and conveying information. Communicates effectively in performance of duties.	Clearly articulates thoughts and ideas, verbally and in writing. Communication in all forms is accurate, intelligible, concise, and timely. Communicates with clarity and verve, ensuring understanding of intent or purpose. Encourages and considers the contributions of others.		Highly developed facility in verbal communication. Adept in composing written documents of the highest quality. Combines presence and verbal skills which engender confidence and achieve understanding irrespective of the setting, situation, or size of the group addressed. Displays an intuitive sense of when and how to listen.				

A ☐   B ☐   C ☐   D ☐   E ☐   F ☐   G ☐   H ☐

JUSTIFICATION:

1. Marine Reported On:
a. Last Name   b. First Name   c. MI   d. SSN   2. Occasion and Period Covered:
a. OCC   b. From   To

G. INTELLECT AND WISDOM

1. PROFESSIONAL MILITARY EDUCATION (PME). Commitment to intellectual growth in ways beneficial to the Marine Corps. Increases the breadth and depth of warfighting and leadership aptitude. Resources include resident schools; professional qualifications and certification processes; nonresident and other extension courses; civilian educational institution coursework; a personal reading program that includes (but is not limited to) selections from the Commandant's Reading List; participation in discussion groups and military societies; and involvement in learning through new technologies.

ADV	Maintains currency in required military skills and related developments. Has completed or is enrolled in appropriate level of PME for grade and level of experience. Recognizes and understands new and creative approaches to service issues. Remains abreast of contemporary concepts and issues.		PME outlook extends beyond MOS and required education. Develops and follows a comprehensive personal program which includes broadened professional reading and/or academic course work; advances new concepts and ideas.		Dedicated to life-long learning. As a result of active and continuous efforts, widely recognized as an intellectual leader in professionally related topics. Makes time for study and takes advantage of all resources and programs. Introduces new and creative approaches to service issues. Engages in a broad spectrum of forums and dialogues.		N/O
A	B	C	D	E	F	G	H
☐	☐	☐	☐	☐	☐	☐	☐

2. DECISION MAKING ABILITY. Viable and timely problem solution. Contributing elements are judgment and decisiveness. Decisions reflect the balance between an optimal solution and a satisfactory, workable solution that generates tempo. Decisions are made within the context of the commander's established intent and the goal of mission accomplishment. Anticipation, mental agility, intuition, and success are inherent.

ADV	Makes sound decisions leading to mission accomplishment. Actively collects and evaluates information and weighs alternatives to achieve timely results. Confidently approaches problems, accepts responsibility for outcomes.		Demonstrates mental agility; effectively prioritizes and solves multiple complex problems. Analytical abilities enhanced by experience, education, and intuition. Anticipates problems and implements viable, long-term solutions. Steadfast, willing to make difficult decisions.		mplex problems. Seldom matched analytical a		N/O
A	B	C	D	E	F	G	H
☐	☐	☐	☐	☐	☐	☐	☐

3. JUDGMENT. The discretionary aspect of decision making. Draws on core values, knowledge, and personal experience to make wise choices. Comprehends the consequences of contemplated courses of action.

ADV	Majority of judgments are measured, circumspect, relevant, and correct.		Decisions are consistent and uniformly correct, tempered by consideration of their consequences. Able to identify, isolate and assess relevant factors in the decision making process. Opinions sought by others. Subordinates personal interests in favor of impartiality.		Decisions reflect exceptional insight and wisdom beyond this Marine's experience. Counsel sought by all; often an arbiter. Consistent, superior judgment inspires the confidence of seniors.		N/O
A	B	C	D	E	F	G	H
☐	☐	☐	☐	☐	☐	☐	☐

JUSTIFICATION:

H. FULFILLMENT OF EVALUATION RESPONSIBILITIES

1. EVALUATIONS. The extent to which this officer serving as a reporting official conducted, or required others to conduct, accurate, uninflated, and timely evaluations.

ADV	Occasionally submitted untimely or administratively incorrect evaluations. As RES, submitted one or more reports that contained inflated markings. As RO, concurred with one or more reports from subordinates that were returned by HQMC for inflated marking.		Prepared uninflated evaluations which were consistently submitted on time. Evaluations accurately described performance and character. Evaluations contained no inflated markings. No reports returned by RO or HQMC for inflated marking. No subordinates reports returned by HQMC for inflated marking. Few, if any, reports were returned by RO or HQMC for administrative errors. Section Cs were void of superlatives. Justifications were specific, verifiable, substantive, and where possible, quantifiable and supported the markings.		No reports submitted late. No reports returned by either RO or HQMC for administrative correction or inflated markings. No subordinates' reports returned by HQMC for administrative correction or inflated markings. Returned procedurally or administratively incorrect reports to subordinates for correction. As RO nonconcurred with all inflated reports.		N/O
A	B	C	D	E	F	G	H
☐	☐	☐	☐	☐	☐	☐	☐

JUSTIFICATION:

92

1. Marine Reported On				2. Occasion and Period Covered		
a. Last Name	b. First Name	c. MI	d. SSN	a. OCC	b. From	To

I. DIRECTED AND ADDITIONAL COMMENTS

J. CERTIFICATION

1. I CERTIFY that to the best of my knowledge and belief all entries made hereon are true and without prejudice or partiality and that I have provided a signed copy of this report to the Marine Reported on.

(Signature of Reporting Senior)

(Date in YYYYMMDD format)

2. I ACKNOWLEDGE the adverse nature of this report and

☐ I have no statement to make

☐ I have attached a statement

(Signature of Marine Reported On)

(Date in YYYYMMDD format)

K. REVIEWING OFFICER COMMENTS

1. OBSERVATION: ☐ Sufficient   ☐ Insufficient   2. EVALUATION: ☐ Concur   ☐ Do Not Concur

3. COMPARATIVE ASSESSMENT	DESCRIPTION		COMPARATIVE ASSESSMENT
Provide a comparative assessment of potential by placing an "X" in the appropriate box. In making the comparison, consider all Marines of this grade whose professional abilities are known to you personally.	THE EMINENTLY QUALIFIED MARINE	☐	
	ONE OF THE FEW EXCEPTIONALLY QUALIFIED MARINES	☐	
	ONE OF THE MANY HIGHLY QUALIFIED PROFESSIONALS WHO FORM THE MAJORITY OF THIS GRADE	☐ ☐ ☐	
	A QUALIFIED MARINE	☐	
	UNSATISFACTORY	☐	

4. REVIEWING OFFICER COMMENTS: Amplify your comparative assessment mark; evaluate potential for continued professional development to include: promotion, command, assignment, resident PME, and retention; and put Reporting Senior marks and comments in perspective.

5. I CERTIFY that to the best of my knowledge and belief all entries made hereon are true and without prejudice or partiality.

(Signature of Reviewing Officer)

(Date in YYYYMMDD format)

6. I ACKNOWLEDGE the adverse nature of this report and

☐ I have no statement to make

☐ I have attached a statement

(Signature of Marine Reported On)

(Date in YYYYMMDD format)

L. ADDENDUM PAGE

ADDENDUM PAGE ATTACHED: YES

NAVMC 10835E (Rev. 1-99) (EF)
SN. 0119-LF-069-1000

PAGE 5 OF 5

93

USMC FITNESS REPORT (1610)
NAVMC 11257 (1-95/BF)
SN. 8109-LF-071-7400

ADDENDUM PAGE

DO NOT STAPLE
THIS FORM

A. PURPOSE

1. Marine Reported On

a. Last Name	b. First Name	c. MI	d. SSN	e. Grade	2. Occasion and Period Covered
					a. OCC	b. From	To

3. Purpose

a. Continuation of Comments			b. Accelerated Promotion Justification	c. Adverse Report		d. Admin Review	e. Supplemental Material	f. HQMC Use
Justification	Section I	RO		MRO Statement	3rd Officer Sighter			
☐	☐	☐	☐	☐	☐	☐	☐	☐

B. TEXT

C. SUBMITTED BY

1. a. Last Name	b. First Name	c. MI	2. SSN	3. Service	4. Grade

Signature

(Date in YYYYMMDD format)

D. GENERAL/SENIOR OFFICER ADVERSE REPORT SIGHTING

1. a. Last Name	b. First Name	c. MI	2. SSN	3. Service	4. Grade

5. Title

Signature

(Date in YYYYMMDD format)

PAGE ____ OF ____

APPENDIX B. ACT SAT CONVERSION CHART

SAT CR+M (Score Range)	ACT Composite Score	SAT CR+M (Single Score)
1600	36	1600
1540–1590	35	1560
1490–1530	34	1510
1440–1480	33	1460
1400–1430	32	1420
1360–1390	31	1380
1330–1350	30	1340
1290–1320	29	1300
1250–1280	28	1260
1210–1240	27	1220
1170–1200	26	1190
1130–1160	25	1150
1090–1120	24	1110
1050–1080	23	1070
1020–1040	22	1030
980–1010	21	990
940–970	20	950
900–930	19	910
860–890	18	870
820–850	17	830
770–810	16	790
720–760	15	740
670–710	14	690
620–660	13	640
560–610	12	590
510–550	11	530

THIS PAGE INTENTIONALLY LEFT BLANK

APPENDIX C. DEGREES CATEGORIZED AS STEM

STEM Degree Types		
AERONAUTICS	ENGINEERING, BIOMEDICAL	MEDICINE
APPLIED MATHEMATICS	ENGINEERING, CHEMICAL	METEOROLOGY
ASTRONOMY	ENGINEERING, CIVIL	MICROBIOLOGY
BIO-CHEMISTRY	ENGINEERING, COMMUNICATION	NATURAL RESOURCES
BIOLOGICAL SCIENCE	ENGINEERING, ELECTRIC POWER TECH	NATURAL SCIENCE
BIOLOGY	ENGINEERING, ELECTRICAL	NUCLEAR ENGINEERING
BOTANY	ENGINEERING, ELECTRONIC	OCEANOGRAPHY
BUILDING SCIENCE	ENGINEERING, GEOLOGICAL	OPERATIONAL ANALYSIS
CHEMISTRY	ENGINEERING, INDUSTRIAL	OPERATIONS RESEARCH
CHIROPRACTOR	ENGINEERING, MANAGEMENT	PATHOLOGY
COMPUTER ENGINEERING	ENGINEERING, MARINE	PHARMACY
COMPUTER SCIENCE	ENGINEERING, MECHANICAL	PHYSICAL SCIENCE
EARTH SCIENCE	ENGINEERING, METALLURGICAL	PHYSICS
ECONOMICS	ENGINEERING, MINING	PHYSIOLOGY
ELECTRONICS	ENTOMOLOGY	PRE-MEDICINE
ELECTRONICS TECHNOLOGY	GENETICS	PSYCHOLOGY
ENGINEER, AEROSPACE	GEOLOGY	SCIENCE
ENGINEERING	MANAGEMENT INDUSTRIAL ENGINEER	VETERINARY MEDICINE
ENGINEERING ADMINISTRATION	MATHEMATICS	ZOOLOGY
ENGINEERING, AERONAUTICAL		

THIS PAGE INTENTIONALLY LEFT BLANK

APPENDIX D. FITNESS REPORT MODEL FOR RETENTION AT YEAR 6

VARIABLES	M.E.	VARIABLES	M.E.
Female	0.4692***	law_mos	0.3572
	(0.1597)		(0.2384)
Hispanic	-0.1973	air_mos	-0.4612***
	(0.1546)		(0.1075)
AGEatCOMM	-0.0683***	PFT_10	0.0122***
	(0.0187)		(0.0019)
Naturalized	-0.7942***	HiRifQualYOAS_10	-0.0237
	(0.2579)		(0.0788)
GCT	-0.0096**	HiPisQualYOAS_10	-0.0364
	(0.0047)		(0.0709)
TopColl	-0.0757	InjWounded_10	-0.0377
	(0.0839)		(0.1542)
PriCollege	0.0882	Awards_10	0.1260***
	(0.0879)		(0.0095)
Academy	0.1308	SeaServRib_10	-0.1892***
	(0.1348)		(0.0388)
NROTC	0.0184	commission_2000	-0.0689
	(0.1325)		(0.1354)
MECEP	0.4897***	commission_2001	-0.1376
	(0.1318)		(0.1377)
PLC	-0.4008***	commission_2002	-0.0723
	(0.1230)		(0.1366)
BacSTEM	-0.0641	commission_2003	0.4541***
	(0.0898)		(0.1413)
tbs_overall_gpa	0.3330***	commission_2004	0.1378
	(0.0130)		(0.1379)
css_mos	0.2688**	Constant	59.7724***
	(0.1091)		(1.1932)
avgrd_mos	0.7596***	Observations	5,144
	(0.1792)	R-squared	0.223

Standard errors in parentheses; *** p<0.01, ** p<0.05, * p<0.1

THIS PAGE INTENTIONALLY LEFT BLANK

LIST OF REFERENCES

Arias Jr, W., & Dal, S. (2006). *Hispanics in the U.S. military*.(Master's thesis). Retrieved from Calhoun http://hdl.handle.net/10945/2671

Buddin, R. (1984). *Analysis of Early Military Attrition*, RB-2001-2. Retrieved from http://www.rand.org/content/dam/rand/pubs/research_briefs/2007/RB2001-2.pdf

Bozick, R., & Lauff, E. (2007). *A first look at the initial postsecondary experiences of the high school sophomore class of 2002* (NCES 2008–308). Retrieved from http://nces.ed.gov/pubs2008/2008308.pdf

Bowman, W., & Mehay, S. (2002). College quality and Employee job performance: Evidence from naval officers. *Industrial and Labor Relations Review 55*(4), Retrieved from http://ssrn.com/abstract=322820

Duncan Hunter National Defense Authorization (NDAA of 2009)Act of 2009, Pub. L. No. 110–417, Sec 596 (2008). Retrieved from http://www.gpo.gov/fdsys/pkg/PLAW-110publ417/html/PLAW-110publ417.htm

Ennis, S. R., Ríos-Vargas, M., & Albert, N. G. (2011). *Hispanic population 2010*. Washington, DC: U.S. Census Bureau website: http://www.census.gov/prod/cen2010/briefs/c2010br-04.pdf.

Ergun, L. (2003). *An analysis of officer accession programs and the career development of U.S. Marine Corps Officers* (Master's thesis). Retrieved from Calhoun https://calhoun.nps.edu/bitstream/handle/10945/1118/03Mar_Ergun.pdf?sequence =1

Fry, R. (2012). Pew Research Center, *Hispanic high school graduates pass whites in rate of college enrollment*. Retrieved from http://www.pewhispanic.org/2013/05/09/hispanic-high-school-graduates-pass-whites-in-rate-of-college-enrollment/.

Garza, R. (2014). *United States Marine Corps career designation board: Significant factors in predicting selection* (master's thesis). Retrieved from Calhoun https://calhoun.nps.edu/handle/10945/41381

Gilroy, C., Eitelberg, M., Enns, J., Hosek, S., Kilburn, R., Laurence, J., …Verdugo, N. (1997). *Career progression of minority and woman officers*. Washington, D.C.: Office of the Under Secretary of Defense Personnel and Readiness. Retrieved from http://www.quantico.marines.mil/Portals/147/Docs/Resources/EOA/EO_Career%20Progression%20of%20Women%20and%20Minority%20Officers.pdf

Hattiangadi, A. U., Quester, A. O., & Lee, G. (2004). *Recruiting Hispanics: The Marine Corps experience final report*. Alexandria, VA: Center for Naval Analysis. Retrieved from https://www.cna.org/research/2004/recruiting-hispanics-marine-corps-experience-final

Headquarters Marine Corps (MMSB). (2010, November 19). *Marine Corps Performance Evaluation (Short Title: PES) Manual* (Marine Corps Order 1610.7F CH1-2). Washington, DC: Retrieved from http://www.hqmc.marines.mil/Portals/133/Docs/MCO%20P1610_7F%20W%20CH%201-2.pdf

Humes, K. R., Jones, N. A., & Ramirez, R. R. (2011). *Overview of Race and Hispanic Origin: 2010.* (C2010BR-02) Retrieved from U.S. Census Bureau website: http://www.census.gov/prod/cen2010/briefs/c2010br-02.pdf

McIntosh, M., Seema, S., & Gregory, D. (2011). *Non-citizens in the enlisted U.S. military*. Alexandria, VA: Center For Naval Analysis. Retrieved from https://www.cna.org/research/2011/non-citizens-enlisted-us-military

Military Leadership Diversity Council (MLDC). (2012). *From representation to inclusion: Diversity leadership for the 21st century leadership.* Washington, D.C.: Department of Defense. Retrieved from Department of Defense Diversity website: http://diversity.defense.gov/Portals/51/Documents/Special%20Feature/MLDC_Final_Report.pdf

Original Appointments of U.S. Commissioned officers, 10 U.S. Code § 532 (2004). Retrieved from http://uscode.house.gov/view.xhtml?req=granuleid:USC-prelim-title10-section531&num=0&edition=prelim#sourcecredit

Quester, A., Hattiangadi, A., Lee, G., Hiatt, C., & Shuford, R. (2007). *Black and Hispanic Marines: Their accession, representation, success, and retention in the Corps* (CRM D0016910.A1). Washington, D.C.: Center for Naval Analysis. Retrieved from http://www.cna.org/research/2007/black-hispanic-marines-their-accession

Wiler, D., & Hurndon, N. (2008). *An Analysis of performance at The Basic School as a predictor of officer performance in the operating forces* (master's thesis). Retrieved from Calhoun http://handle.dtic.mil/100.2/ADA479921

Wooldridge, J. M. (2009). Introductory econometrics: *A modern approach* (4th ed.). Mason, OH: South-Western Cengage Learning.

INITIAL DISTRIBUTION LIST

1.   Defense Technical Information Center
        Ft. Belvoir, Virginia

2.   Dudley Knox Library
        Naval Postgraduate School
        Monterey, California